Training Manual

Single Beam Data Processing
CARIS HIPS and SIPS Professional 11.3

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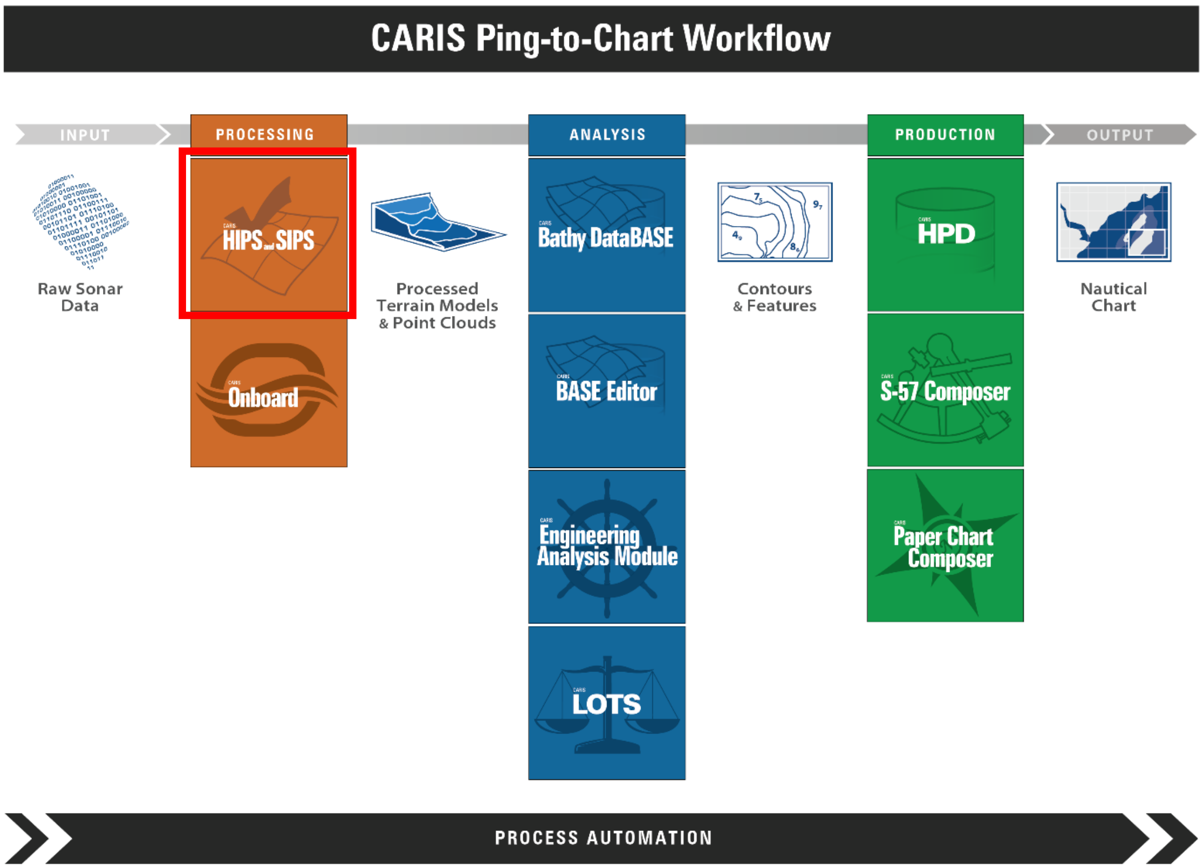
Content

Introduction

CARIS[1] HIPS[2] and SIPS[2] Professional is a comprehensive suite of processing tools tailored for the review and correction of bathymetry and imagery data and product creation. These training course notes cover single beam data processing.



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Acknowledgements

The training dataset used and referenced in this course, is supplied by courtesy of the Canadian Hydrographic service.

Note: This data is for training purposes only.

Course Organization

The following section contains information about the workflow that this training follows and specifics of the dataset provided for training purposes.

Singlebeam Processing workflow follows these major steps:

- **Create a Vessel File**(Optional): Setup the sensor locations and uncertainties in the vessel reference frame.
- **Create a new HIPS file** (Optional): Setup the HIPS Data Source.

  ***Vessel File and HIPS file can optionally be created on Import**

- **Import Sensor Data**: Raw data is imported into HIPS data format.
- **Save Project:** Save the current workspace (data and current view).

- **Clean Auxiliary Sensor Data:** Sensors, such as gyro and navigation, are cleaned individually.
- **Clean Soundings**: View and edit raw, time-referenced data on a line-by-line basis.
-

  Georeference Bathymetry: Combine vertical and horizontal information to produce geo-referenced data.
  - **Load Tide**: Load tide data from one or more Tide Stations

- **Create Surface**: Processed Depths data is used to produce a bathymetric surface.

- **Sounding Selection**: Use the Surface for selection of a representative sounding set.
- **Export Soundings**: The soundings can be exported to a shapefile, ascii or others.

Survey System / Data Information

The following is a summary of the sensor offsets for the equipment on vessel and information about the data collected.

Sample Data Set

- Dual frequency single beam sonar.
- Vessel: Single_Beam_Vessel_Bold
- Date Collected: 1st August, 1998 (Julian Date 1998-213).
- Raw Data recorded in Hypack format

Sensor Offsets

- Transducer1: dX=0.0, dY= 0.0, dZ= 0.0, Roll= 0.0, Pitch= 0.00 and Yaw= 0.00
- Navigation: Time Error = 0.0, dX = 0.00, dY = 0.00 and dZ = 0.00, Ellipsoid=WG84
- Gyro: 0.00
- SVP 1: dX=0.0, dY= 0.0, dZ= 0.0, Roll= 0.0, Pitch= 0.00 and Yaw= 0.00

Positioning information

- Data in both Projected (UTM-12N) and geographic coordinates.
- Referenced to WG84 ellipsoid.

Rawness of data

- Not corrected for vessel motion (No sensor data).
- Travel time and distance are computed from single beam values

Relevant Ancillary Data

- Tide data = portblackney.cow
- SVP data = sv213a_b.svp

Vessel and HIPS Files

In HIPS and SIPS, you can compile the relevant information to create one or more vessel files associated with the acquired raw data. Next, you can create a HIPS file, inside which all imported HIPS data is logically organized. The HIPS file will reference the vessel file(s) so that there is always a link back to the sensor information, used for processing.

Vessel Editor

The Vessel Editor is used to create and edit HIPS Vessel Files (HVF). The HVF contains information necessary for combining all sensor data to create a final position/depth record. Since all sensor entries are time-stamped, one HIPS vessel file can be used for the life of a vessel. If a sensor is moved or added, the new offset information is given a new time stamp. HIPS processes will compare the date and time of the observed data with the date and time of the HVF sensor information to ensure that the appropriate offsets for that time are used.

Note: It is not possible to process sensor data time-stamped prior to the earliest HVF time stamp, as the program applies the most recent information.

Note: The positions of the sensors on the HVF may not be the same as the actual configuration of the vessel. For example, if sensor offsets are applied in the acquisition software, the HVF should describe the “corrected” position, not the actual position of the sensor.

In the following exercises you will open the Vessel Editor and configure a new vessel file. The vessel file configured will use the system information for the CHS Launch *Bold*.

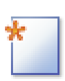
Vessel Wizard

We will start by launching the Vessel Wizard from the Vessel Editor to begin the initial set-up of the vessel file. The Vessel Wizard takes the user through a step-by-step process to configure a vessel file from scratch. This vessel file can then be edited further in Vessel Editor.

Exercise 1.

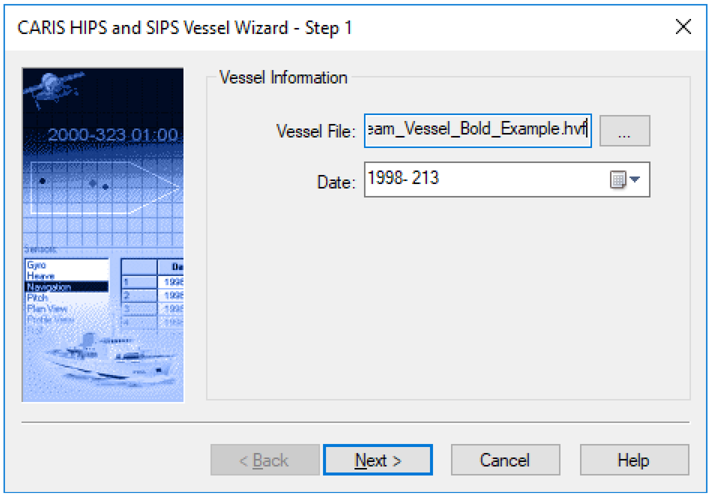
a. Click **Vessel Editor** icon, or select **Tools > Editors > Vessel…** option from the main menu.

This will open the CARIS HIPS and SIPS Vessel Editor.



b. Click the **New** icon or select **File > New** option from the Vessel Editor menu.

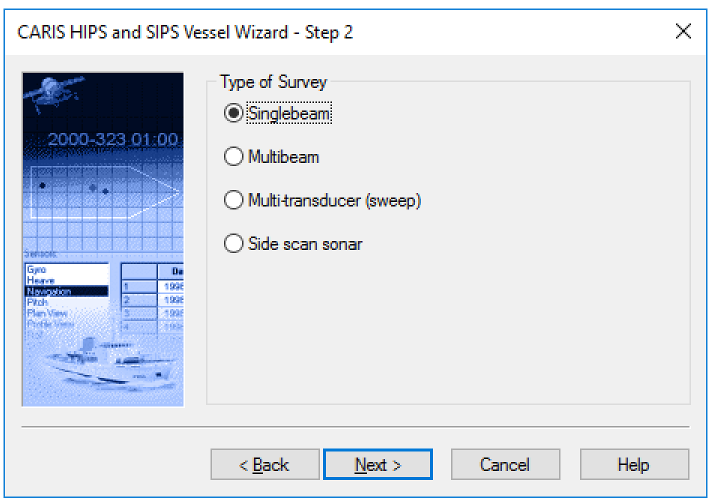
The CARIS HIPS and SIPS Vessel wizard will open. The first step of the wizard enables you to enter the vessel name and the mobilization date.



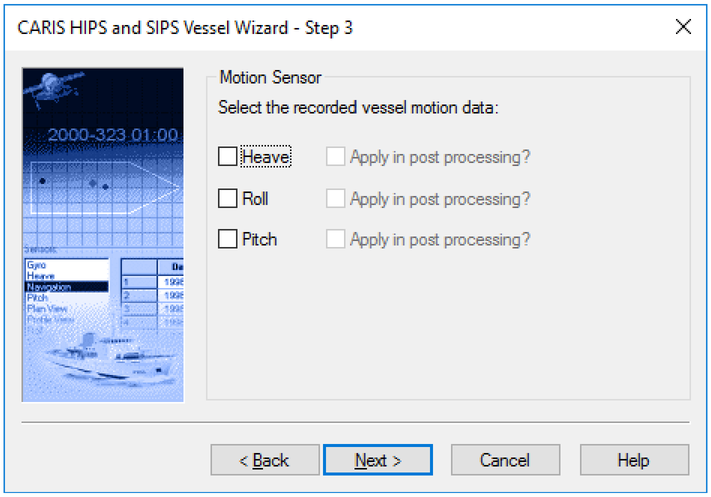
c. On **Vessel File** click the browse (…) and navigate to the folder **…\Training\HIPS\HDCS_Data\VesselConfig** and name the vessel **Single_Beam_Vessel_Bold_example,** click **Next**.

d. On **Date** and type **1998** for the year and **213** for the day. You can click the Calendar button on the right side and double-click **August 1, 1998** as well**.** Use the arrows to change the month. Click **Next**.

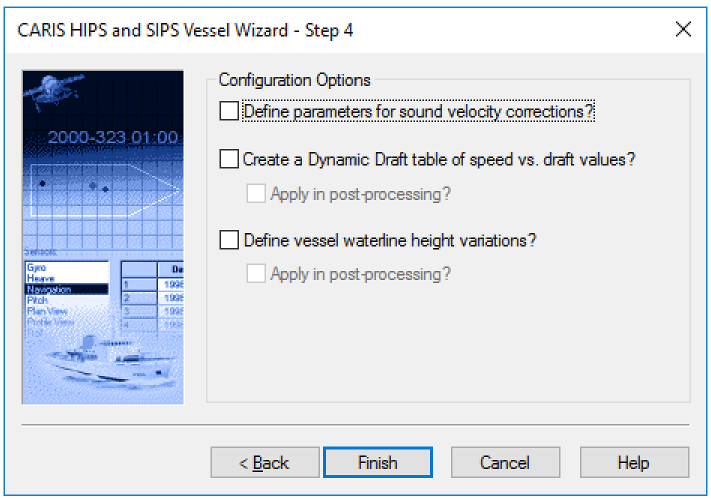
Note: The vessel date must be before the start of your data collection. For easy identification is safe to use January 1 of the year the MBES was set up on the vessel.



e. Step 2: Select the **Singlebeam** radio button for the Type of Survey and click **Next.**



f. Leave all **Motion Sensor** disabled in Step 3.



g. In Step 4 leave all options disabled and click **Finish**

Vessel Shape

The Vessel Shape collect information to generate graphic views of the ship. All dimensions are in meters.

Advantages of the vessel shape diagram:

- Allows visual location of the Reference Point (RP).
- Allows visual location of all the sensors with relation to the RP.
- Allows immediate visual verification that offsets have been applied correctly.

Note: The vessel shape **does not** affect processed data. It is merely for visualization purposes in the HIPS Vessel Editor.

A vessel can be defined or modified by selecting **Edit > Vessel Shape** from the main menu or by selecting the **Vessel Shape** Button from the main toolbar.

The sensor installation history of the ship is logged with time stamps so that a single HVF can contain many installations.

Sensor Display Control

Active sensors of the current vessel configuration file are listed in the lower left window of Vessel Editor. Sensors can be added to or removed from the display. Only active sensors can be configured for installation offsets, biases and errors.

The table display shows the configuration parameters of the sensor.

- Several entries can be made with a time stamp index: date and time.
- A time stamp is required for each table entry.

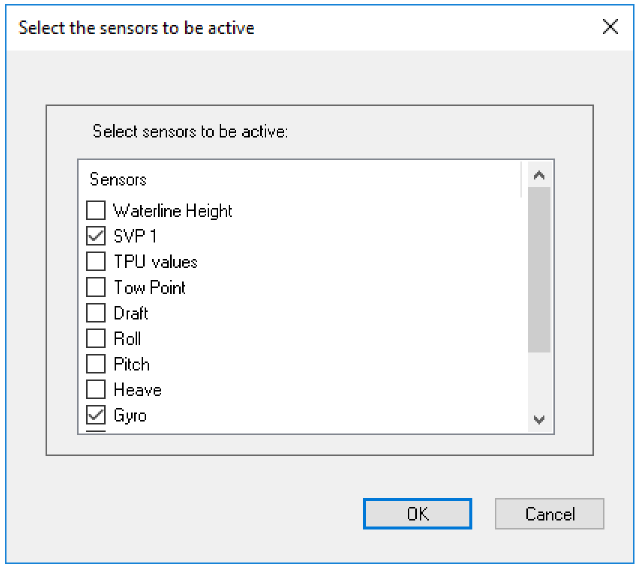
The following sensors can be activated and configured for any HVF:

- Waterline Height
- SVP 1 & 2
- TPU values
- Tow Point
- Draft
- Roll
- Pitch
- Heave
- Gyro
- Navigation
- Transducer 2
- Transducer 1

In this exercise, you will add SVP 1.

Exercise 2.

a. Click the **Active Sensor** icon or select **Edit > Active Sensors** from the Vessel Editor menu.



b. Enable the **SVP 1** check box and click **OK**.

This will add SVP1 to the list.

c. Select **SVP 1** as additional **sensor to be active** if not already configured and click **OK**.

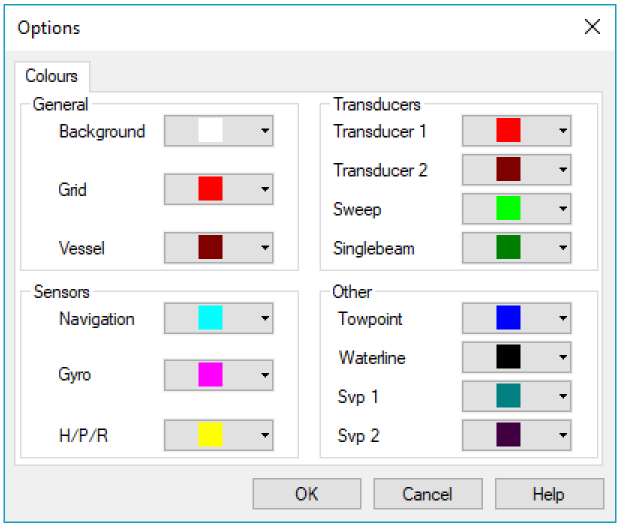
d. Click the **Save** icon and select **File > Exit** to close the Vessel Editor.

Note: Always ensure the appropriate device model has been set in the **Model** field of the **Transducer 1** sensor within the HIPS vessel file, as these values are utilized during TPU computation as well as surface creation. If a sonar model is not available within the dropdown list, new entries can be added to the **devicemodels.xml** file. Additionally, the existing values can be updated if the settings for your sonar differ from those entered within the file. The **devicemodels.xml** can be found in the HIPS **System** directory of the HIPS installation. For additional information of the configuration of the values within the **devicemodels.xml** file, refer to **https://www.teledynecaris.com/en/products/total-propagated-uncertainty/**. If a sonar is not included in the file, these values can be obtained from the sonar manufactures and sent to CARIS to be added in a future release. Also, please refer to the **TechNote – HIPS – Regular Gridded Surface Generation.pdf** for some additional information on how these values are utilized within the algorithms used during surface creation.

Options

Vessel Editor has options to change colours and the default ellipsoid for the HVF. These are available from the **Tools** > **Options** menu in Vessel Editor.

The various sensors displayed with the Vessel Shape are represented by coloured spheres. The **Colours** tab controls the colours used for the display of the Vessel Shape as well as for the available sensors.



Many users keep records of the offsets used on their vessels. HIPS and SIPS gives users the option to export a vessel configuration report to a text file.

Sensor Section

Each active sensor for the vessel is listed in the bottom left window of Vessel Editor. When a sensor is highlighted in the list, its sensor offsets and other information can be edited. Now that we have created an HVF for this vessel, we will continue with entering the relevant information for it. (Refer to the Survey System / Data Information section if needed.)

The location of the position source must be established. If the logged positions are relative to an antenna, then that location with respect to the RP must be entered.

The HIPS File

Once converted to HIPS format, data can be opened in the main interface. HIPS and SIPS stores a HIPS file (<name>.hips). The *.hips file is a SQLite database, which stores metadata, line information, default and customized attributes and objects, critical soundings, side scan contacts and navigation data under a CARIS Simple Feature specification. When a project was created prior to version 8.0, it had a *.HPF (HIPS Project File) file. This *.hpf file should trigger an update asking you to set the coordinate reference system. If the HPF is absent and the HIPS file is required to open on the current version, you should use the Upgrade Project option (**File** > **Import** > **Upgrade Project...**), giving to the software the location of the HIPS data source (located within the HDCS_Data folder), the software will create a HIPS file for it, allowing you to open the HIPS data source on the current version. Once a HIPS file is open you can delete lines.

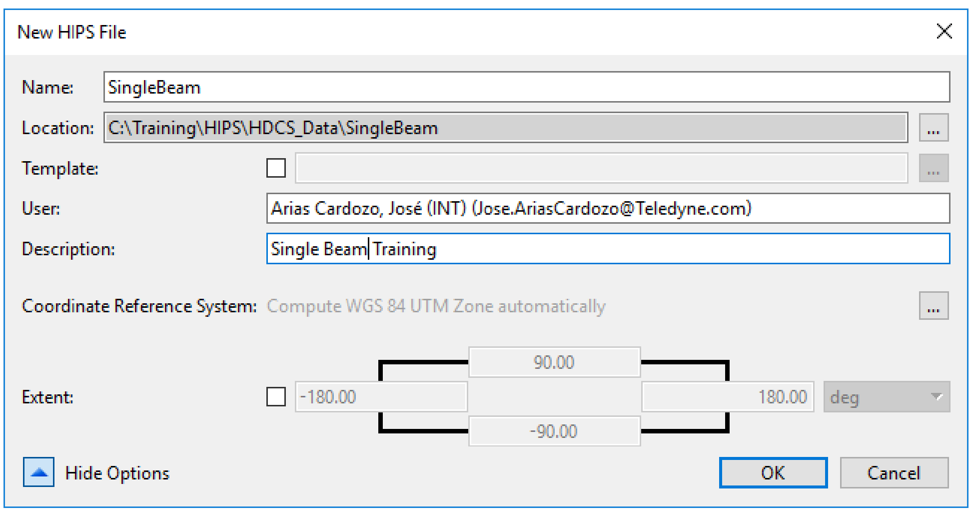
Note: We do not recommend deleting lines outside of the HIPS application.

Create a HIPS File

Follow the steps below to create a new *.HIPS data source for this training exercise.

Exercise 3.

a. Select **File > New > HIPS File** from the menu.



The Name by default is **New HIPS data**, followed by today's date, also the location by default is **My documents** on the Local Machine. Those names and locations can be changed at the time you're creating a HIPS file.

Selecting the blue arrow, **Show options** allows you to access additional options during the HIPS file creation.

A **Template** can be used in order to just change Names and locations but always using the same **User**, **Coordinate Reference System (CRS)** and **Extents**.

The **User** name is taken from the Login session username

You can type a brief **Description** of the HIPS file.

Also the **Coordinate Reference System** of the HIPS file can be defined here.

Finally the **Extent** of the project is the whole earth by default, but you can restrict this, changing the **Coordinate** numbers, using the **display extents** or a **box selected on the display**.

b. On **Name** type **SingleBeam**

c. On **Location** browse to **…\Training\HIPS\HDCS_Data**.

d. On Description, type **Single Beam Training**.

e. Click **OK**

The new HIPS file has been created.

Note: The user can also enter **Extent**s. This enables users to define the HIPS data sources geographical extents. Any data that falls outside of these extents will not be displayed in HIPS. The default region is the entire globe.

Importing Raw Data

Raw/unprocessed survey data is converted into HIPS/SIPS format through the Conversion Wizard. In order to convert raw data, users must know specific format information about the data, have already set up a vessel file, and created a HIPS data source or have an existing HIPS data source to use.

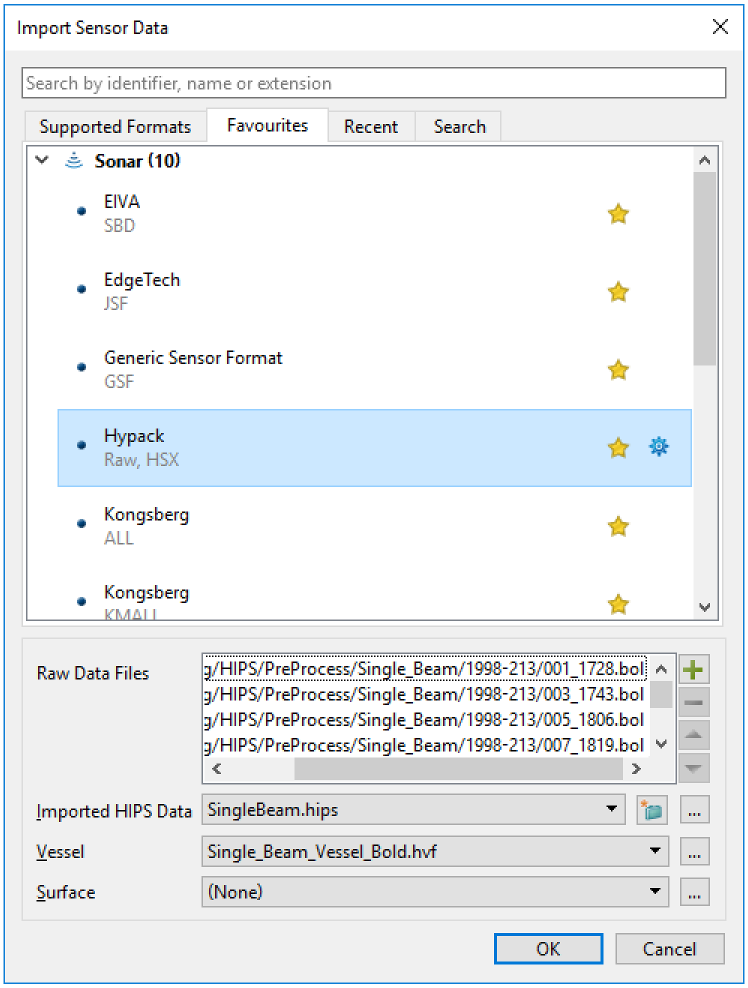
Data that is converted to HIPS and SIPS format may be in varying stages of completion, depending on the data format options. HIPS and SIPS supports over 40 different raw formats for conversion. Corrections can be made to the data after conversion.

Import Sensor Data

The Import Sensor Data window dialogue, gives you the options to import raw/unprocessed data into HIPS/SIPS format.

Exercise 4.

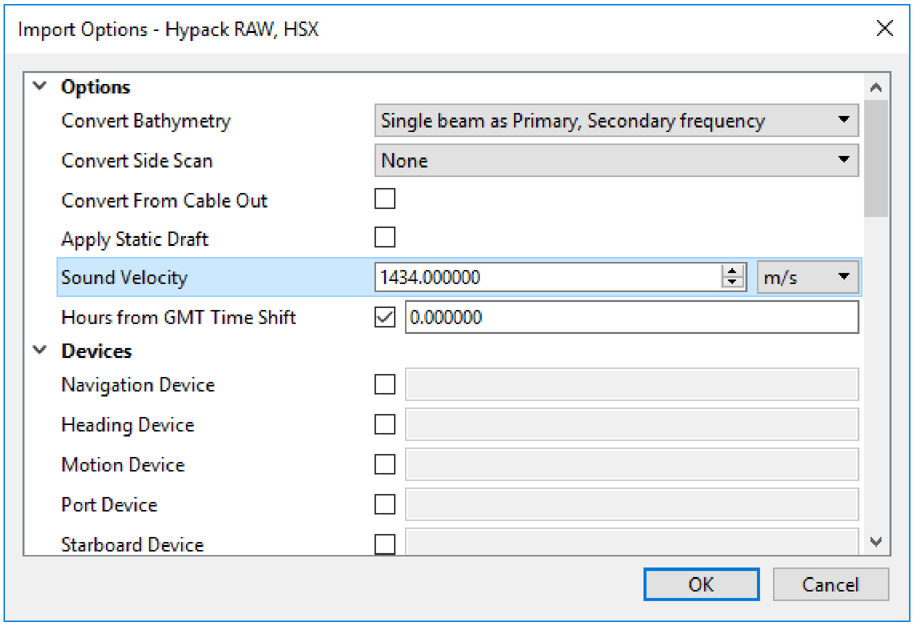
a. Click the **Import Sensor Data** icon or select **File > Import > Sensor Data...** from the menu.



b. In **Formats**, click **Hypack RAW, HSX** from the list of formats

c. Click the blue cog to access the import options dialog window**.**

The Hypack data files are ASCII text files that can be opened in any text editor. Reading the file it is possible to distinguish the sensor data for both the Navigation and Depth. In addition, at the top of the file the Sound Velocity value entered in the Echosounder is recorded, this value can be used in the converter at this step. This will allow the conversion to take the depth and angle (assumed to be 0 (zero) down) and calculate a travel time and distance to be used for a Sound Velocity Correction. This value is 1434 m/s.



d. Select **Single beam as Primary, Secondary frequency** from the Convert Bathymetry dropdown menu.

e. Enter **1434** m/s as the Sound Velocity.

f. Leave all additional properties to default**,** click **OK.**

If Ground Coordinates were stored within the raw data file, the appropriate coordinate reference system must be selected from the Input > Input Coordiante Reference System browse (…) button.

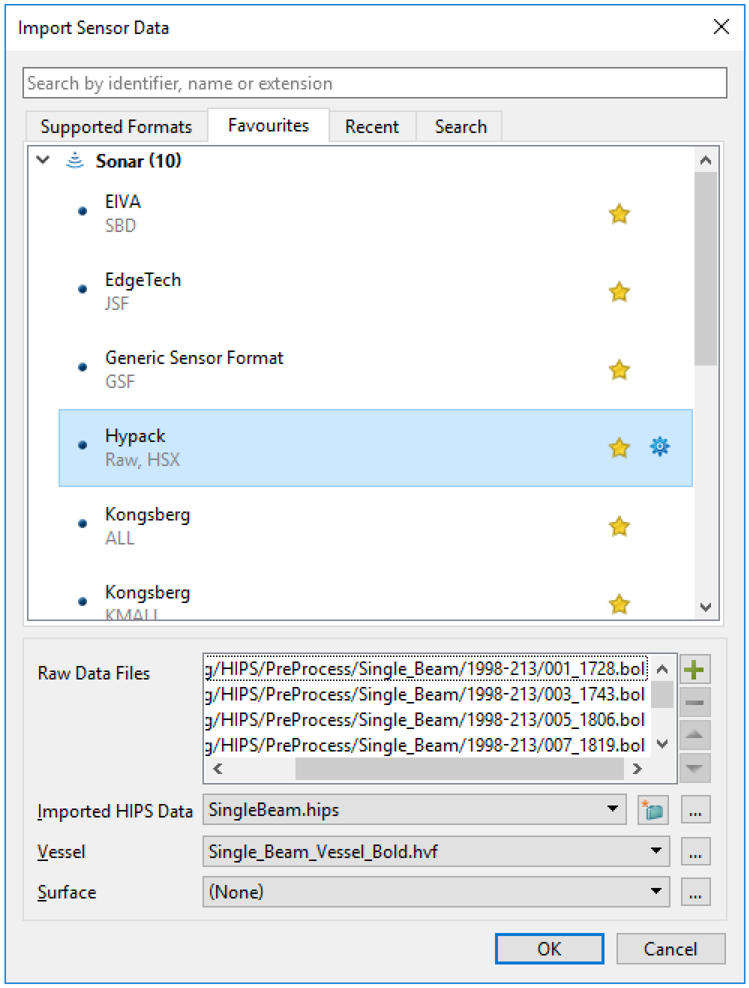
Optionally, a copy of this Raw Data can be stored within each line folder by selecting the **Carry Over Raw Data Files** option if the Raw Data may become unavailable at a later time.

For existing data within a HIPS Data Source, the raw data can be re-imported using the **Overwrite** option, which overwrites select portions of the existing data, such as Navigation records, Backscatter data, etc.

The **Filter Extent Type** and **Extent** options are useful to restrict navigation data to a specific geographic region. The geographic region can be defined manually or by HIPS File extents.

The **Filter Data** is used to reject large bathymetric spikes that fall outside of the minimum and maximum depths of the survey area.

Now we will define the data to import and what HIPS and Vessel files to utilize.



g. Click the green **+** icon for **Raw Data Files**, browse to the **...\Training\HIPS\PreProcess\Single_Beam\1998-213** folder, select **All Files (*.*)** from the drop list. Select all of the ***.bol** files and click **Open**.

h. Click the (**…**) browse button for **Imported HIPS Data**, browse to the **…\Training\HIPS\HDCS_Data\Singlebeam** folder, select the **Singlebeam.hips** file and click **Open**.

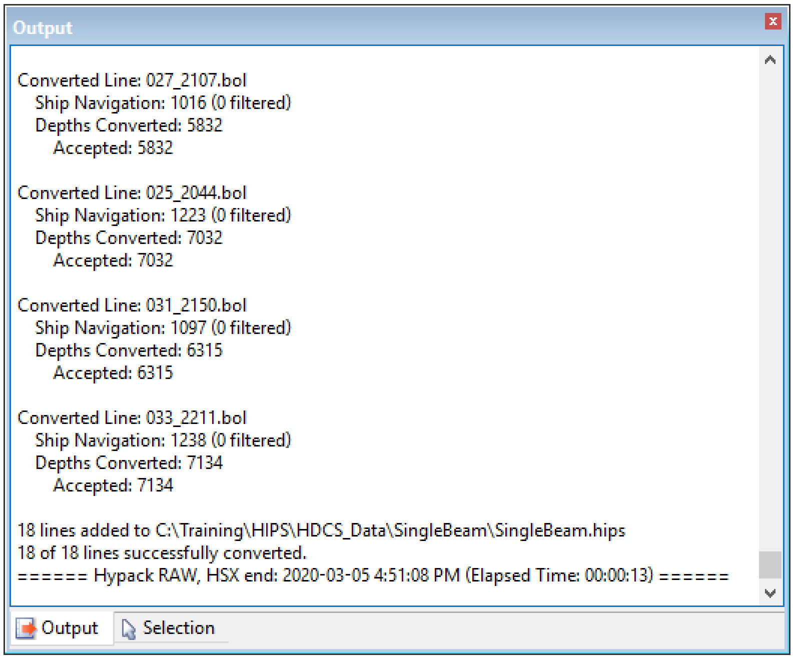
On **Imported HIPS Data**, the user can use a previous created **.hips** file, or can create a new one using the icon **Create a New HIPS file** on this step.

i. Click the (**…**) browse button for **Vessel**, browse to the **…\Training\HIPS\HDCS_Data\VesselConfig** folder, select the **Single_Beam_Vessel_Bold.hvf** file and click **Open**.

j. Select **(None)** from the **Surface** drop down menu.

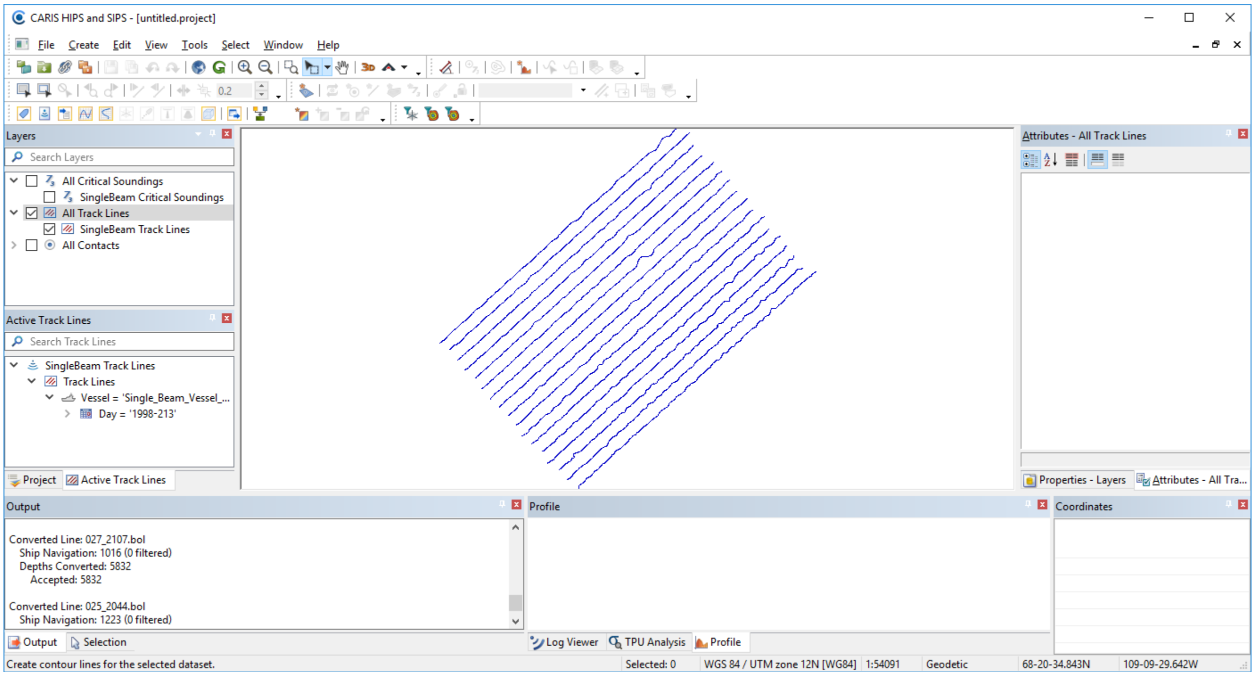
k. Click **OK**.

Progress is tracked by a progress bar in the dialog box, and once data is imported the outcome is reported in the Output Window.



Open Survey Data

The HIPS file will be automatically open in the main HIPS and SIPS interface, following the initial conversion.



In HIPS 11 there is a function called "Check HIPS File", found it in the right-click menu on the Project layer within the Project window.

It scans all of the navigation sources in the HIPS data source to make sure all of the raw files are still available, and prompts you to fix paths if they are not. The function runs automatically on the background when a .HIPS file is opened in HIPS.

Getting Around in HIPS

The HIPS and SIPS interface is very similar to other CARIS software. It's made up of movable windows that contain different kinds of useful information. This section is intended as an orientation to the SIPS interface.

Save Project

A project file allows you to capture all the data sources and their properties that are currently open. This file remembers all the data you have open (metadata, survey lines, etc.) and consists of a series of data objects in XML format describing:

- **Workspace** – Creator of the session, HIPS project name, creation and last modification times, and location of the HIPS source data
- **View Extent** – The last used window size and location
- **Project Data** – Survey lines, CARIS files and background images

The Project (*.project) file replaces the previous CARIS Session (*.wrk files). Eventually these project files will be the same across all CARIS software packages.

You must still have a background file or dataset open as a geographic reference before you can create a project file.

Exercise 5.

a. Save the project by selecting **File > Save > Save Project As…** call the project **SingleBeam** under the folder **…\Training\HIPS\Projects** and click **Save**.

Projects should be used to efficiently organize the data that you are working with. Having a series of small work areas as separate projects instead of one large project will allow for faster, more effective data access.

In addition, the Project can add **Sources from Project**, allowing you to add sources from a saved project in to the current one. Once the current project is opened, the files referenced by the saved project file open and the display properties from that saved project file, are applied to the current opened files.

b. Close all data by clicking **Close Project** icon, or selecting the **File > Close all** menu item.

c. Open the Project by clicking the **Open Project** icon or with **File > > Open > Project** menu. Choose **Singlebeam.project**.

Clean Auxiliary Sensor Data

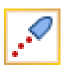
The following sections will show how to clean auxiliary sensor data. Specifically, we will look at the Navigation Editor and the Attitude Editor. The Navigation Editor is used to clean spikes in navigation by analyzing plots of speed vs. time, distance vs. time, and course made good vs. time. The Attitude Editor is used to smooth and filter motion and other auxiliary sensors.

Navigation Editor

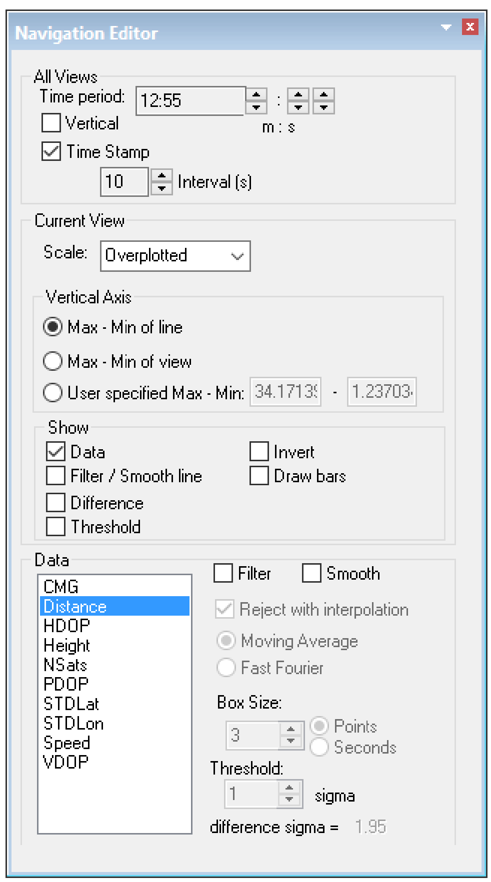
Use Navigation Editor to examine and clean individual position fixes as recorded by the vessel's positioning system.

Exercise 6.

a. Select the line **001_1728** in either the **Active Track Lines** or **Display** window.



b. Click on the **Navigation Editor** icon or the **Tools > Editors > Navigation > Navigation Editor** menu command.



The Navigation Editor window will be added. Track lines are displayed within the Display window as a series of continuous symbols, with each point representing a navigation fix.

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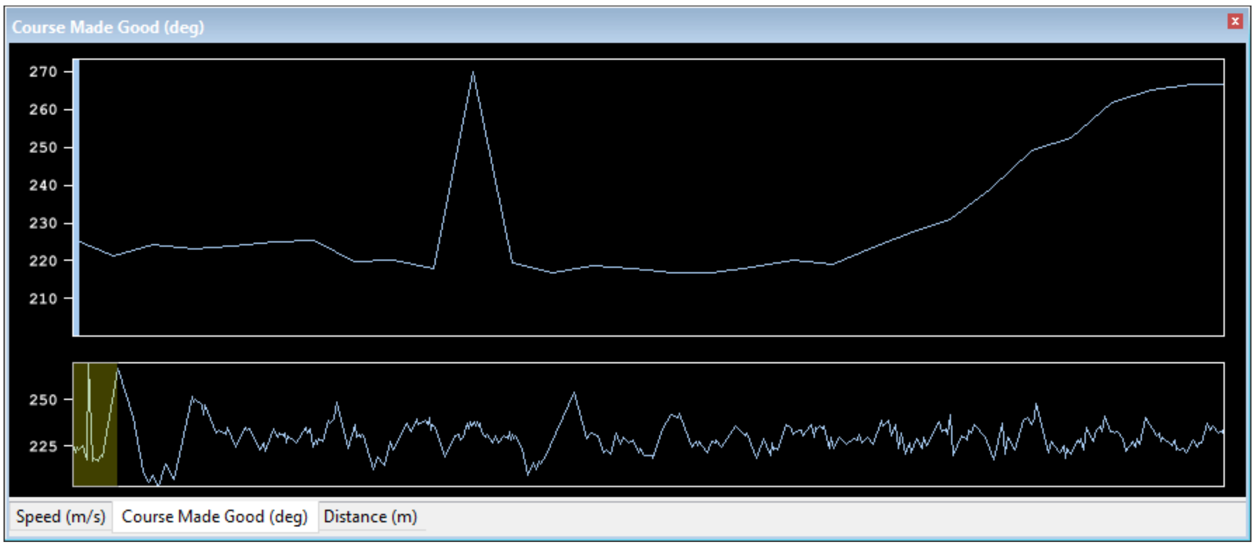
As seen in the image above, CMG, Distance, HDOP, Height, PDOP, STDLat, STDLon, Speed and VDOP are all listed in the Data section of the Navigation Editor. If interested in removing one of the graphs from the view, the menu can be used.

c. Go to **Tools > Editors > Navigation** and click **CMG**.

d. In the dropdown menu a checkmark beside the data source indicates the graph is visible. Selecting that same source, a second time will remove the graph from the display, removing the checkmark.

e. Alternately, expand the tree (-) beside the Ship Track Lines layer within the Layers window. Select the **HDCS.Nav** layer and right-click to select **Window** and choose the data source of interest to remove or display as a graph. Select **CMG** from the droplist.



The Navigation Editor window displays graphs for Speed, Course Made Good and Distance data. The above image shows the CMG data. The Overview graph is displayed at the bottom of the window showing all data for the selected line. The yellow slice allows the user to manual edit how much of the data should be visible in the upper graph.

f. With your mouse in the middle of the yellow slice, the user can click hold and move the yellow slice along the selected lines data.

g. Moving your mouse to the left or right edge of the yellow slice a double arrow will display. Click hold and move your mouse to increase the amount of data visible in the upper graph.

h. To maximize your screen real estate, right-click within the Distance graph and click **Hide Overview** to remove the overview from the graph. Right-click again and select **Show Overview** to redisplay the overview.

The **Navigation Editor** has the following options:

The **All Views** section has three controls that act on all of the time-series graphs together. The time period option determines the amount of data to be shown in graph; the longer the period of time, the more data displays. The Vertical option switches the graphs to run vertically and you can also select it to enable Time Stamps to be displayed on the graphs and specify the interval.

The **Current View** options enables you to specify if the vertical scale will be controlled by the extents of the currently displayed data, the extents of the entire line or user-defined minimum and maximum values is used to choose whether to scale the Y-axis of the graphs based on the values on one screen or the whole line. The Scale options are applied to the data item currently highlighted.

Note: The **Scale** options **Fixed** and **Overplotted** are applicable only to **Attitude Data**, that will be covered on the **Attitude Editor** section.

Select the line type to be displayed in the graphs in the **Show** section. The data display can be enabled/disabled, by going to **Tools > Editor > Navigation** and selecting the source of interest to display or remove from the view. It can also be inverted (for display only), and bars can be drawn to distinguishing each data point.

The **Filter** checkbox is used to turn on filtering for the selected data types. There are two methods of filtering **Moving Average** and **Fast Fourier**. This option is also available in the Filters tab which will be discussed later.

The **Moving Average** option works by averaging data within a window. The window size can be based on seconds or number of data points. Increasing the size of the window increases the level of smoothing.

The **Fast Fourier** option takes out all frequencies which have a shorter wavelength than the box size set in points or seconds.

The **Threshold** option sets the cut-off value as a multiple of the standard deviation. The cut-off value is applied to the difference data.

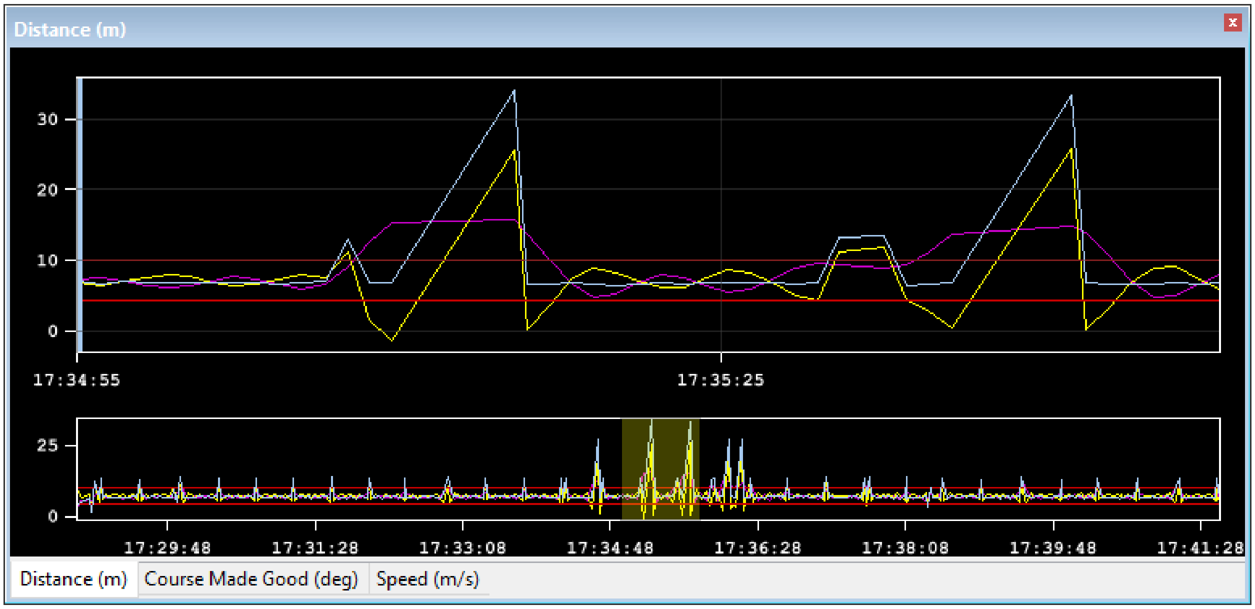
The **Difference** between the filter line and the sensor data is then calculated. This difference will be greater in areas in which local variability is high. Any difference values outside of the threshold limit will be rejected with interpolation.

Each navigation source can be examined with the use of two graphs within a single window extent. An option overview graph at the bottom shows all the line data with a little yellow reference box that you can resize to change the details within the main graph at the top of the window. As you move your mouse within the main graph, a Tooltip box will display information for all sources enabled within the layers window.

Filtering can be applied in three ways:

- Filter screen (only the information displayed by the yellow slice within the graph),
- Filter End of Line (from the yellow slice to the end of the line), or
- Apply interpolate Navigation points outside of Navigation Editor.

Filtering can be applied with or without interpolation.



i. Turn on the **Filter / Smooth line** (purple), **Difference** line (yellow) and **Threshold** line (red) in the Show section of the Navigation Editor window.

j. Lower the **Time period** in the All Views section (at the top of the Navigation Editor window) to **30** seconds.

k. Enable the **Filter** checkbox to access the filtering options at the bottom of the Navigation Editor window.

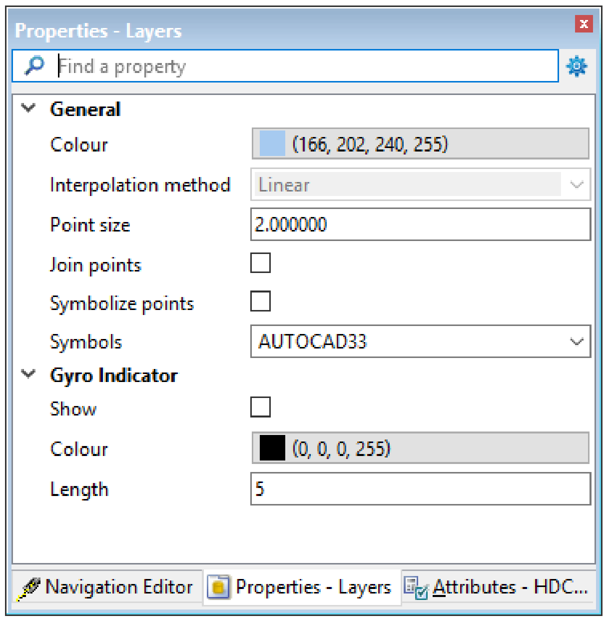
l. Ensure both the **Reject with interpolation** checkbox and **Moving Average** radio buttons are enabled and specify a **Box Size** of **3 Points**. This means a window of 3 points will be centered around every Distance point and that the original value will be replaced by the arithmetic mean of the values in the window.

m. Specify a **Threshold** of **2** sigma. Any difference (yellow) line falling outside of the threshold (red) line will result in those associated Distance point to be rejected.

n. Filter data with the **Filter 1 Screen** icon to apply this filter to the data.

o. To show rejected data enable the **Display filter** icon, then select the down arrow and enable the **Rejected** checkbox, to see any rejected data (grey soundings).

p. You can undo the Changes with the **Undo** icon, or **Edit > Undo** menu.



Additional **Navigation Editor** tools are available in the Properties window.

- The **Interpolation method** section determines the interpolation method used to assign position data to depth observations. This interpolation can be either linear or a tight, medium, or loose Bezier curve.

- The point symbolization options under **General** controls the size and symbology used when display this object within the Display window.

- The **Gyro Indicator** options sets the length and colour of the line providing a visual indication for the direction that the survey line was run.

Navigation Interpolation

Position observations do not usually occur at exactly the same instant in time as a depth estimate or sidescan ping. It is also unlikely that there is an exact position for every ping. For example, positions may be observed every second (1 Hz frequency), while depth pings may be observed 10 times a second (10 Hz frequency) or more.

In most cases, it will be necessary to interpolate positions to match the times for each ping. The interpolation method is set in the Interpolation method section of the Navigation Editor window.

The default method is **Linear**, where interpolation between each successive position is obtained by simply connecting the positions with a straight line. Linear interpolation is suitable when the original navigation positions are clean and do not significantly deviate from the neighbouring positions.

The other three options (Loose, Medium, and Tight) are various degrees of **Bezier Curve**. In these cases, the line of interpolation will not follow the navigation positions exactly.

Navigation Editing

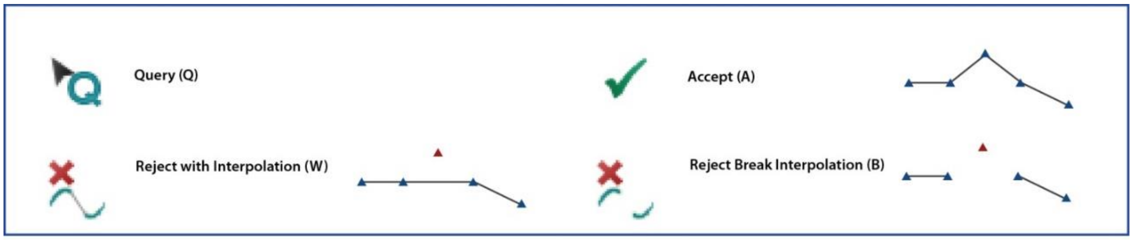
There are four main edit functions that are used when editing data in Navigation or Attitude Editor.

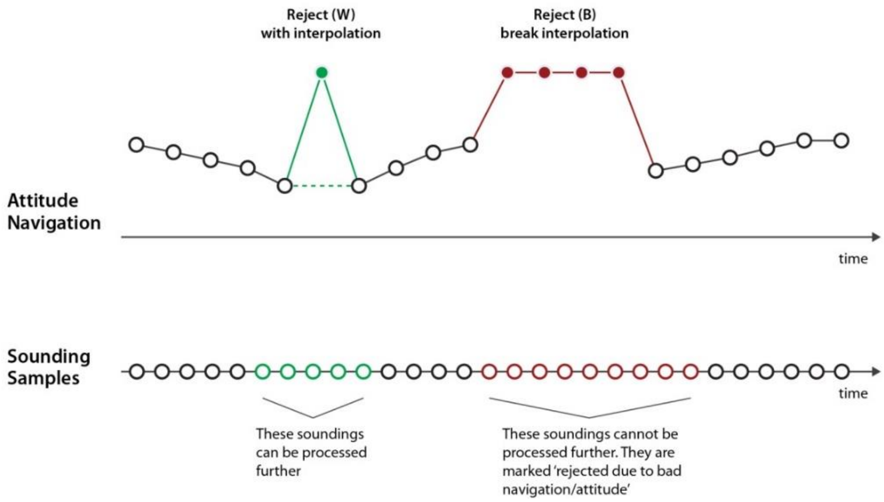
- **Accept -** This will change the status of all selected navigation fixes to accepted. This can also be done by hitting the **A** key after having selected the rejected navigation points.

- **Reject - Break Interpolation -** This will reject selected fix(es) without applying any interpolation between pings. (Remember that the navigation for the pings is interpolated from the navigation data.) This function causes all sonar pings between the navigation fixes immediately before and after the gap to be rejected. This can also be done by hitting the **B** key after having selected the navigation points to be rejected with break interpolation.

- **Reject - With Interpolation -** This rejects selected navigation fixes with interpolation over the gap. This can also be done by hitting the **W** key after having selected the navigation points to be rejected with interpolation. The interpolation between the points is based on what interpolation method is set in the Navigation Editor window.

- **Query -** This give the details of the fixes in Worksheet window. The data can then be sorted in ascending or descending order by clicking the column headings. This can be useful for finding jumps and spikes. The **Q** key can also be used.

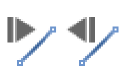




The whole line can be queried by right-clicking with one of the data windows and selecting **Query Line** from the pop-up menu. The data is displayed in the Selection window. This information is in memory, so it lists quickly, remember that the data can be pasted or saved as a text file for use in other software.

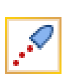
Exercise 7.

a. Check the current line for **CMG** jumps. Reject the data using the method "**with interpolation (W)**" where needed



b. Click on the **Next** and **Previous** icons in the Selection toolbar to move from one line to the next. Click on **Yes** when prompted to save changes to the line.

c. Check all remaining lines for **CMG** jumps. Reject the data using the method "**with interpolation (W)**" where needed.



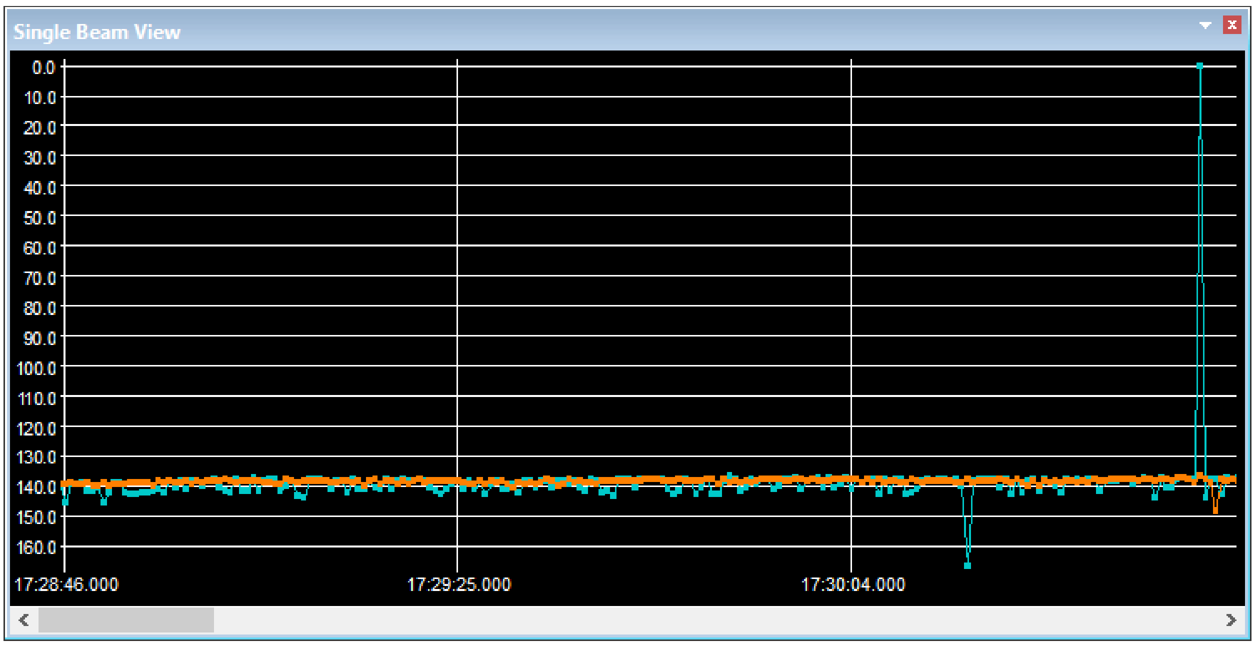
d. Click on the **Navigation Editor** icon to close the editor. If asked, '**Would you like to save your changes?**' Select **Yes** or **No** depending on if the filter applied was valid.

Single Beam Editor

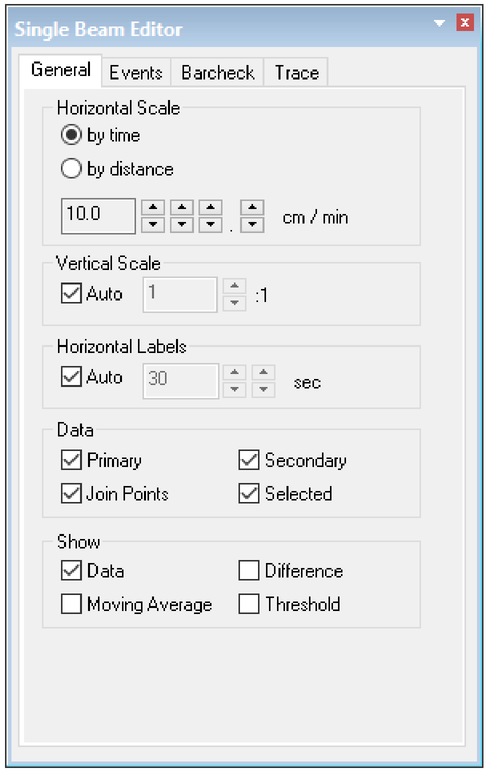
Single Beam Editor is used to display and edit primary and secondary soundings recorded by the echosounder.

Exercise 8.

a. Highlight the line **001_1728** within the **Active Track Lines** window and select the **Single Beam Editor** icon, or go to **Tools > Editors > Single Beam > Single Beam Editor** from the menu.



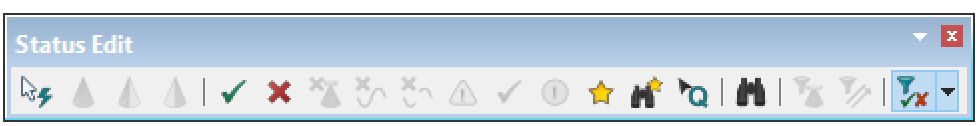
Two new windows will open upon starting the Single Beam Editor. The first being the **Single Beam View**. On default, it displays three graphs, the primary and secondary soundings and the selected soundings. The selected soundings are in this case identical to the primary soundings. The selected soundings will be those soundings used later to represent the survey results.

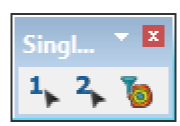


The second window opening is the **Single Beam Editor** window, which contains four tabs.

The General tab includes several options to manage the Horizontal and Vertical Scales, as well as the Horizontal Labels within the Single Beam View.

Under Data four checkboxes including **Primary**, **Secondary, Join Points** and **Selected** are available. These checkboxes allow the user to change what information is displayed within the Single Beam View. In order to mark a sounding as selected sounding, it has to be highlighted in the Single Beam View.





Additional data editing can be done by selecting soundings and rejecting or accepting them. To do that, either use the icon in the **Status Edit** and **Singlebeam** toolbars or use the right-mouse click within the Single Beam View.

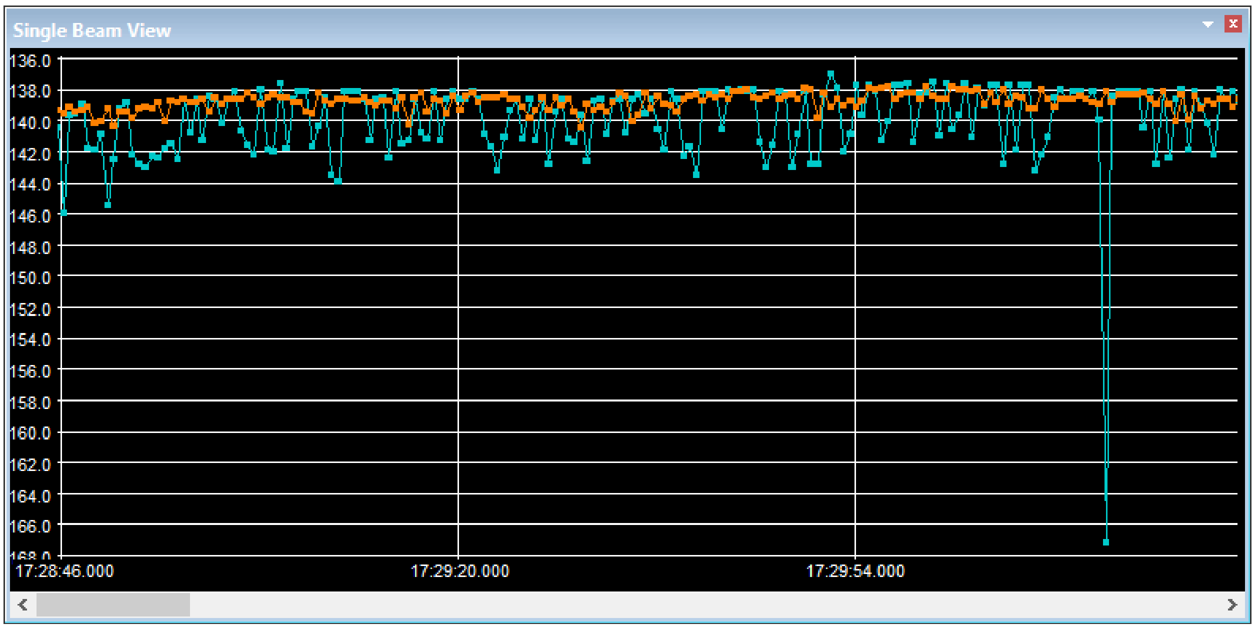
The filter works by constructing a Moving Average of the sensor data. The moving average is a mean value for the sensor created by averaging over a data window containing a certain number of points. The data window is then moved along the line a point at a time and the average at each point is calculated. The effect of increasing the size of the window is to increase the smoothing of the data.

The size of the window used in the moving average can be set by either the number of points or seconds of data. It is set in the Filter box in the **Tools > Editors > Single Beam > Filters…** menu. It is possible to filter the Primary, Secondary, and\or Selected data with this filter.

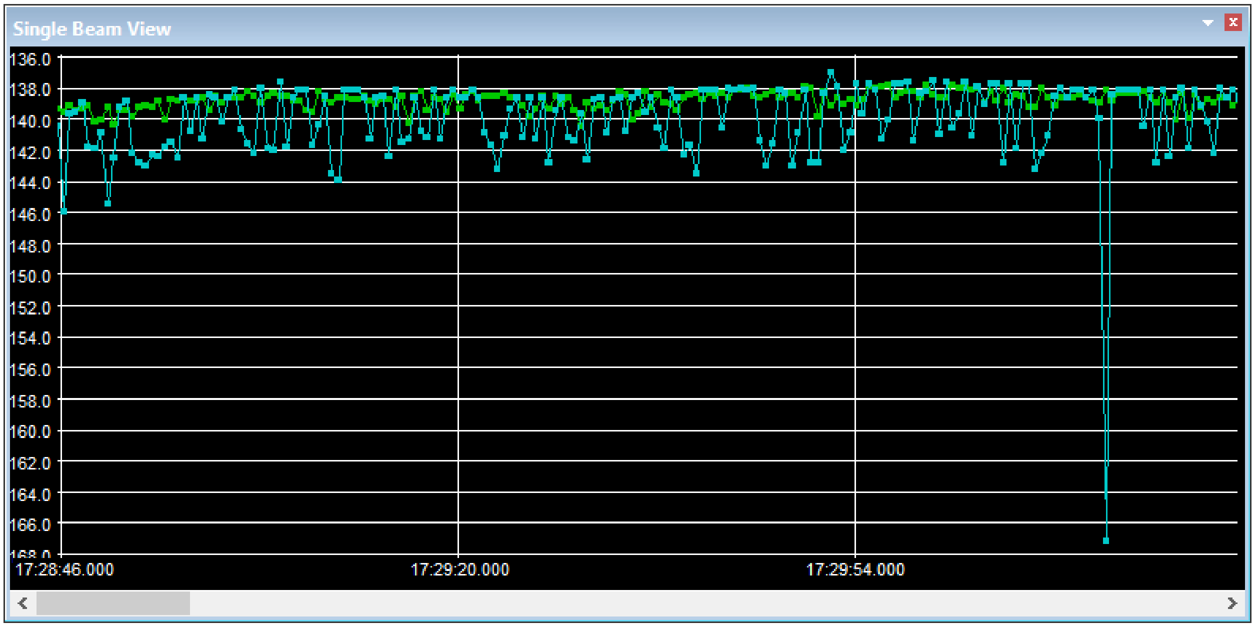
The difference between this moving average and the sensor data is then calculated. This Difference will be greater in areas in which local variability is high.

Finally, a Threshold is applied to the Difference. The threshold is defined as a multiple of the standard deviation of the moving average window. Any difference values outside of this threshold will be rejected with interpolation.

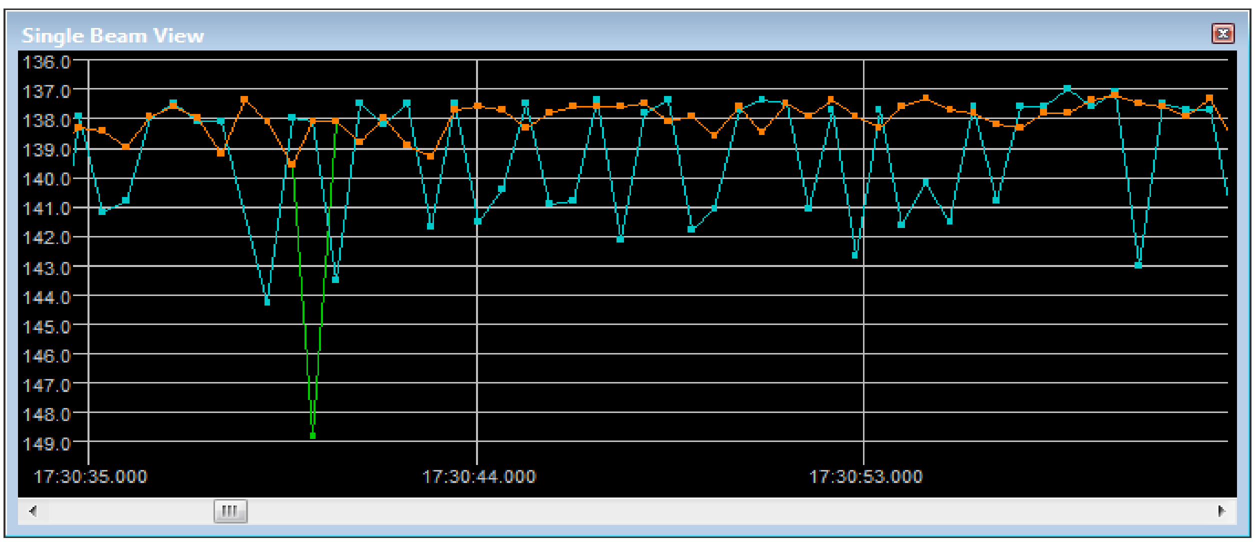
We will start by changing the status flag of some of the soundings than looks at the filtering options within Single Beam Editor.



b. Disable the **Selected** checkbox within the **General** tab. The green Primary Data is displayed.



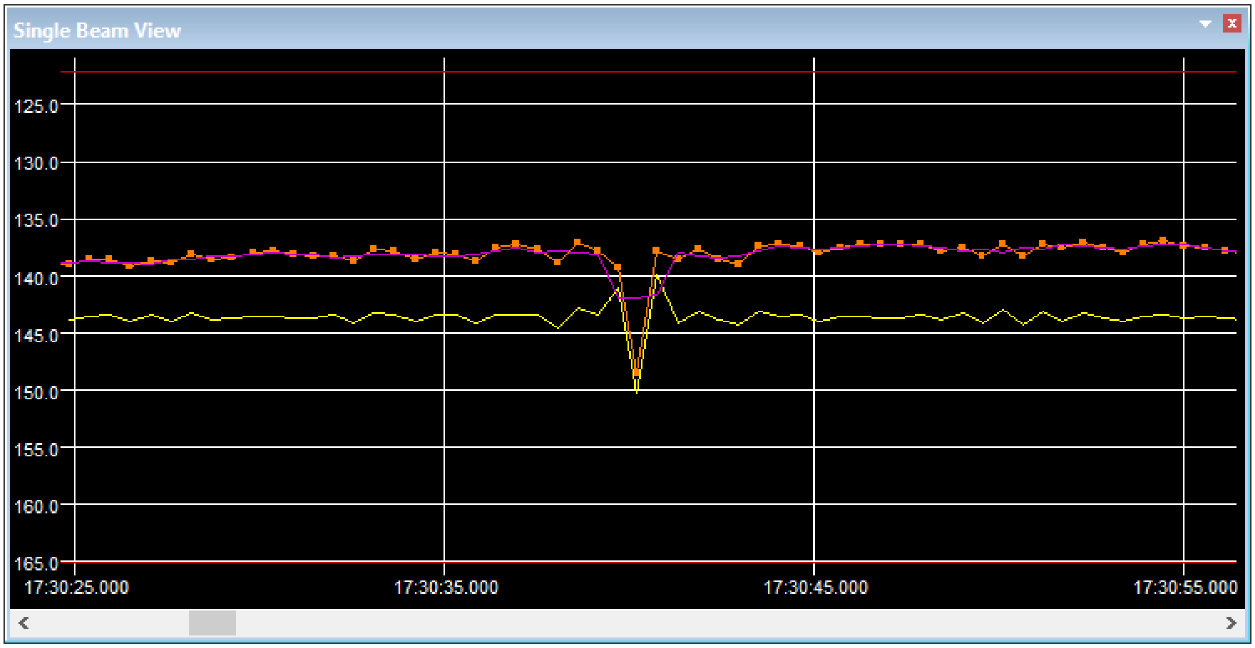
c. To update the **Selected** flagging from a Primary to Secondary Depth, select a secondary sounding within the Singe Beam View.



d. Click the **Select Secondary** icon. The orange Selection line is updated to connect through the selected Secondary sounding.

e. Select the green Primary sounding and click the **Select Primary** icon. The orange Selection line is updated to connect thought the Primary sounding.

Note: When updating the status of the Selected flag between Primary and Secondary soundings, timestamps can be used to make sure the correct adjacent sounding has been choose using the Query icon and Selection window.



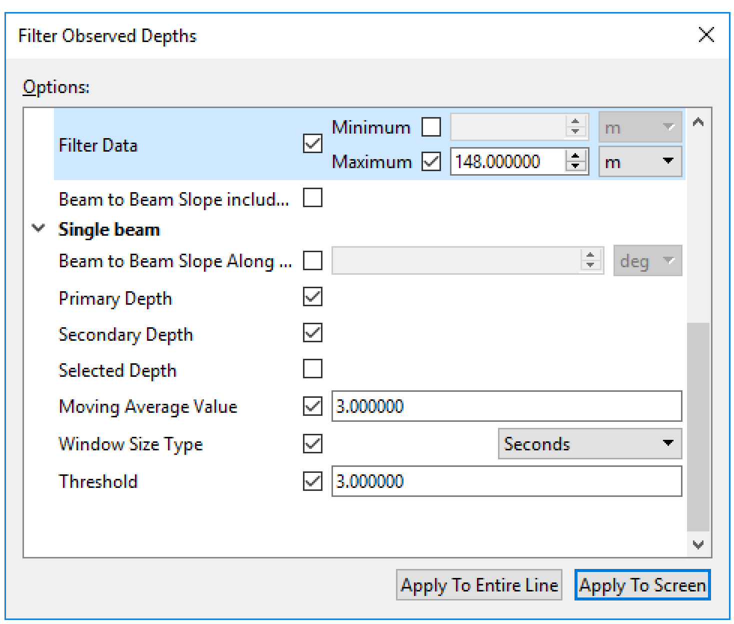
Exercise 9.

a. Disable the **Secondary** checkbox under **Data**

b. Enable all checkboxes under **Show** within the General tab.

c. Use the scroll button within the Single Beam view to move to a timestamp of **17:30:38.000**.

d. Go to **Tools > Editors > Single Beam > Filters…**



e. Enter a Depth Maximum of **148** m on **Filter Data**.

f. Under Single beam, enable the **Primary** and **Selected** checkboxes.

g. Enable the **Moving Average** checkbox and enter a value of **3**.

h. Enable the **Window Size Type** checkbox and choose **Seconds** from the dropdown menu.

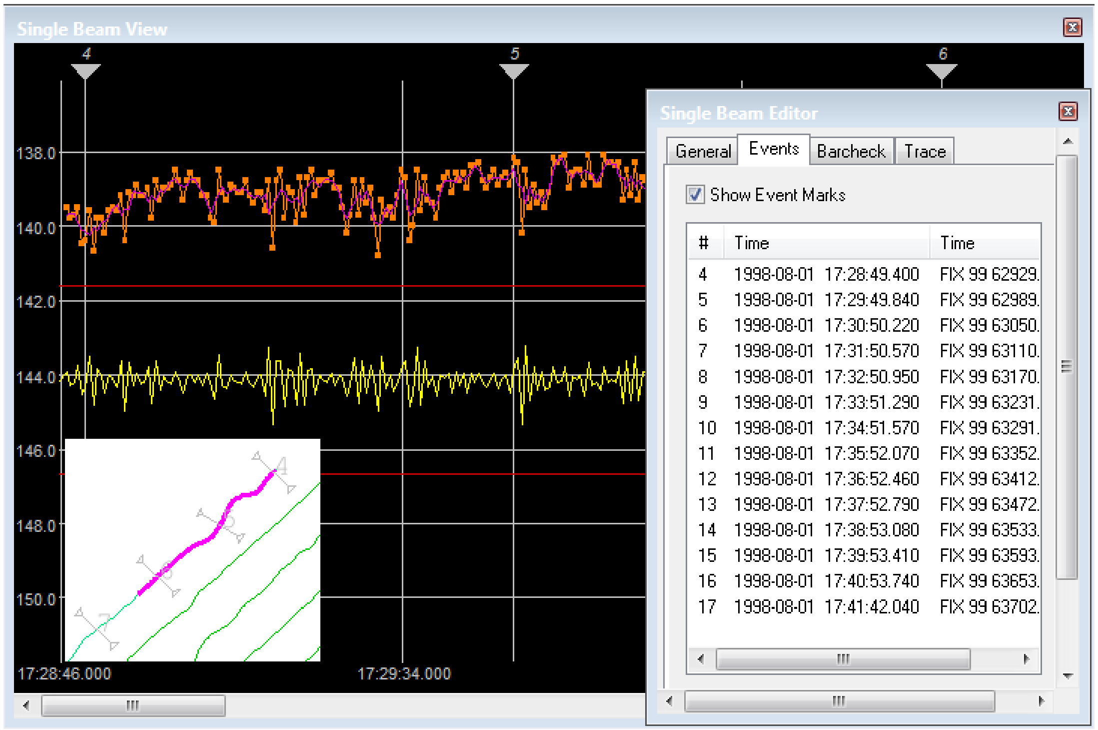
i. Enable the **Threshold** checkbox and enter a value of **3**.

j. Click the **Apply To Screen**. The difference line (yellow) falling outside the threshold line (red) will result in any adjacent Primary and Selected flag types to be filtered.

k. Click the **Undo** icon to bring back any filtered data, and change the filters accordingly.

This filter tool can also be applied to the entire line within the Single Beam Editor or outside a group of lines outside of the Single Beam Editor.

If Event Marks were saved within the Raw data, through the Hypack Converter, they will be converted into HIPS format. Under the Events Tab, it is possible to turn these Events on in both the Single Beam View and the Project Window.



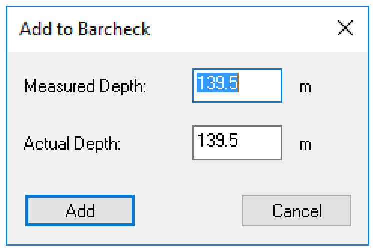
Exercise 10.

a. Select the Events tab and enable the **Show Event Marks** checkbox to display marks within both the **Display** Window and **Single Beam View**.

If Barcheck data is available, it is possible to use it to create a Sound Velocity Profile for use in the Sound Velocity Correction process.

Under the Barcheck tab, there is a list view of the Barcheck values. First the data must be highlighted in the Single Beam View for the first Barcheck, such that it will be averaged and right click in this window to Add to Barcheck, to get this average and the actual value. This is to be done for all Barcheck values such that the profile can then be saved.

However, this is NOT possible if the travel time and distance values have not been converted.



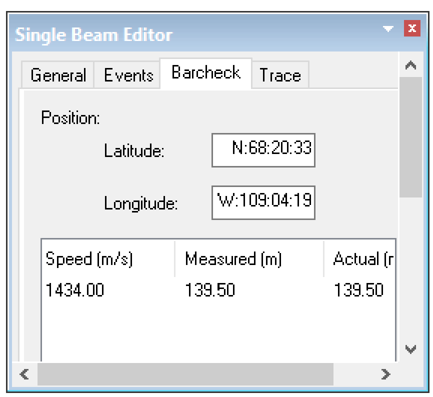
Exercise 11.

a. Highlight a **Primary** Sounding from the Single Beam View.

b. Right-click within the Single Beam View and select **Add to Barcheck…** or go to **Tools > Editors > Single Beam > Add to Barcheck.**

c. The **Measured Depth** would be replaced by the value collected from the Barcheck.

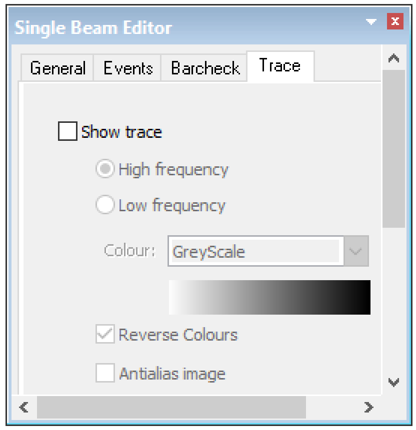
d. Once updated, click **Add**.



e. Previous steps could be repeated for several difference Actual Depths and once completed **Save** could be selected. This will allow the user to save a .SVP file to the SVP folder for use in Georeference Bathymetry, Sound Velocity Correction property.

f. Select the barcheck value(s) within the Barcheck tab and click **Remove**.

HYPACK data can contain a *.bin file that contains an image of the single beam trace. If this data is available, the Show Trace option can be activated. Enabling this option will display the trace image as background in Single Beam Editor.



g. Select the **Single Beam Editor** icon, or go to **Tools > Editors > Single Beam > Single Beam Editor** from the menu, to close the Editor.

Processing Workflow

Now that data has been imported into the HIPS format and indexed, we can utilize the Georeference Bathymetry tool to complete the necessary processes prior to surface generation. The theory below breaks down the specific tools required for this training data.

For more detailed multibeam workflow showing the user various tools available in HIPS and SIPS, reference to Multibeam training manual.

SVP Editor

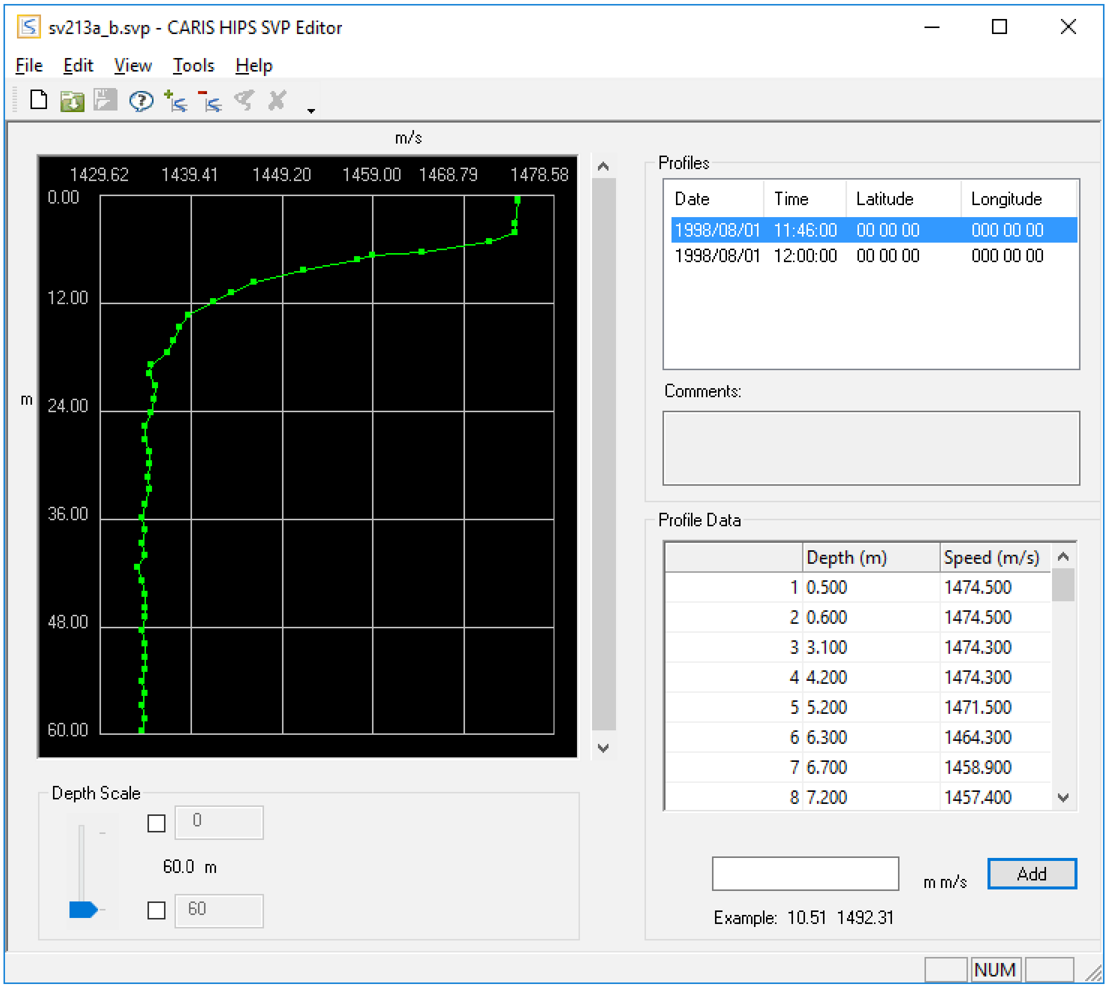
SVP Editor is used to create and edit sound velocity profiles that will be used in the sound velocity correction process. It can be opened by clicking on the SVP Editor icon or by selecting the **Edit** > **Sound Velocity Profiles** menu option.

Exercise 12.

a. Select **SVP Editor** Icon or the menu **Tools > Editors > Sound Velocity Profiles...**

b. Click **File > Open** and browse to the file **sv213a_b.svp** on folder **…\HIPS\SVP\Single_Beam**. click **Open**

There can be a number of profiles in a single file. Each profile must be time-stamped and have a different location specified to differentiate it from other profiles.

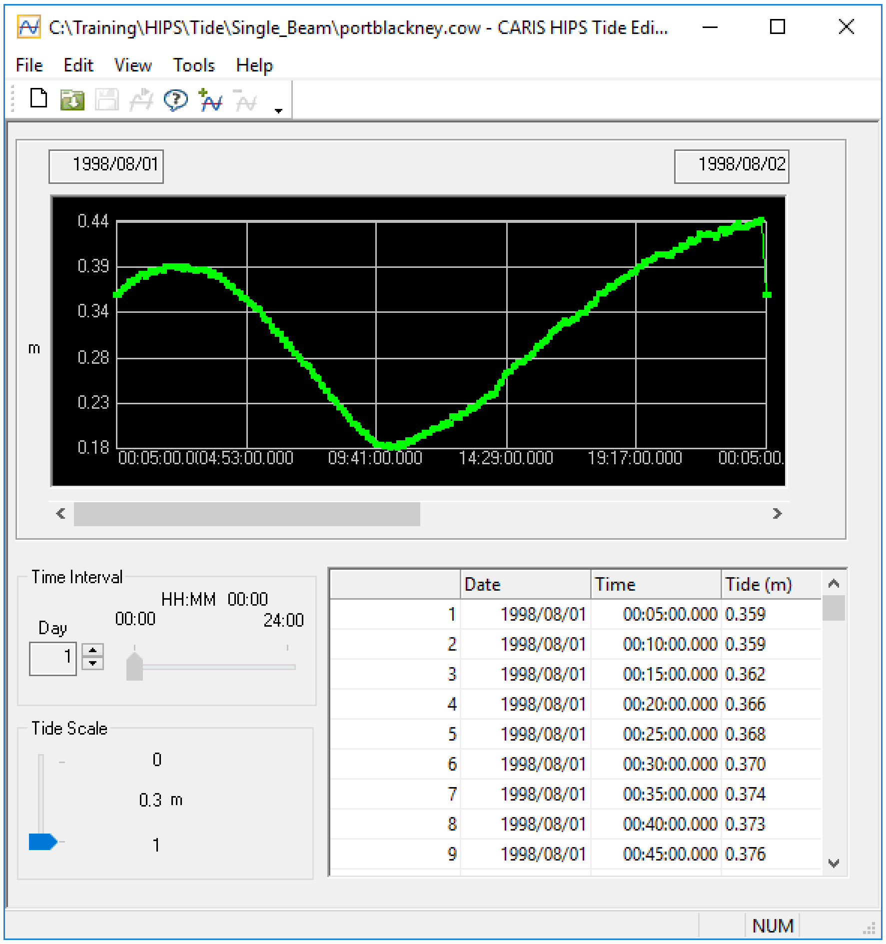


- Positions can be added or changed using **Edit** > **Edit Position**.
- New profiles can be added using the **Edit** > **Add Profile** menu or by directly editing the text file.
- Existing profiles can be removed using **Edit** > **Remove Profile**.
- Profile Data can be removed by selected from the Profile window and using **Edit** > **Delete**.
- **Tools** > **Options** is used to change the appearance of the **SVP Editor** interface

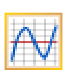
c. Browse through the different profiles, **do not save** any changes.

d. Go to the menu **File > Exit**.

Tide Editor



Exercise 13.



a. Open Tide Editor by clicking the Tide Editor icon or going to **Tools > Editors > Tide...**.

b. Click **File > Open** and browse to the **portblackney.cow** file from the **…\HIPS\Tide\Single_Beam** folder

Positions can be added or changed through **Edit** > **Edit Position**. New data can be added using the **Edit** > **Add Tide** menu. Existing profiles can be removed using **Edit** > **Delete**. **Tools** > **Options** is used to change the appearance of the **Tide Editor** interface.

c. Enter a Time Gap value of **5** minutes, and then click **OK**.

d. Click the Next Time Gap icon or use the **Tools > Next Time Gap** command, to highlight the first time gaps which exceed the value entered in Tools > Options.

e. Go to **File > Exit** Tide Editor, click **No** to the “Save Changes” message.

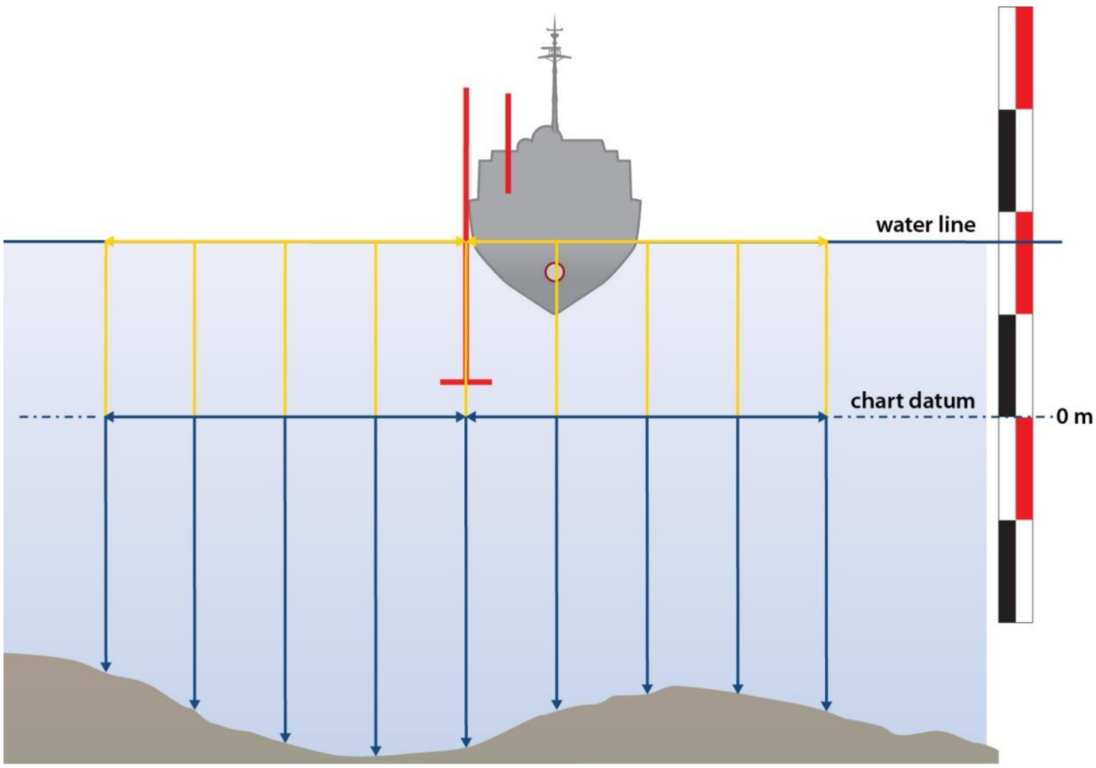
Georeference Process

Once the Georeference Bathymetry process has performed the Sound Velocity Correction and the Tide has been loaded the final sounding depth and geographical position must be calculated.

The Georeference process will combine tide observations, observed depths, sensor data and HVF offsets to produce geo-referenced soundings.

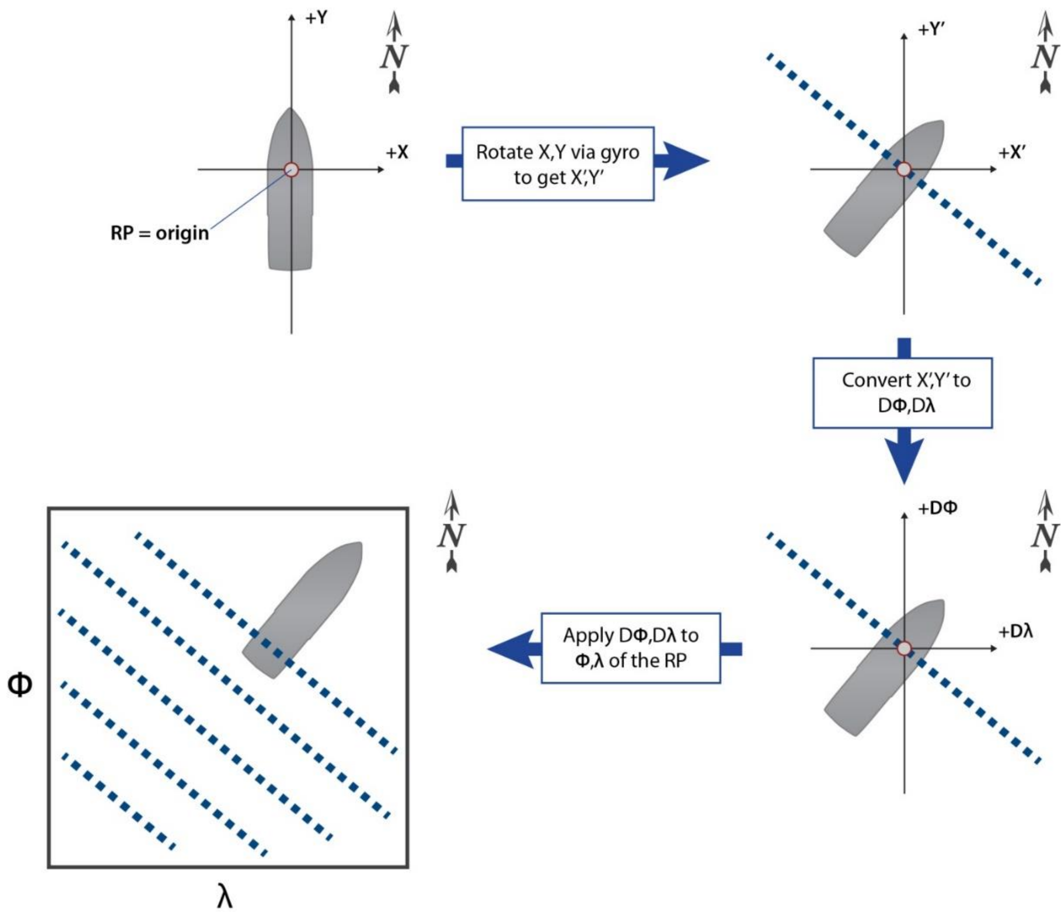
There are two components to the Georeference process: Vertical and Horizontal.

Vertical Component:



- After applying SVC all depths are relative to the waterline. If no SVC was performed, waterline height is applied in Georeference.
- The appropriate tide value (loaded tide or computed GPS Tide) is applied to each depth on Georeference to produce a final depth that is relative to the chart datum.

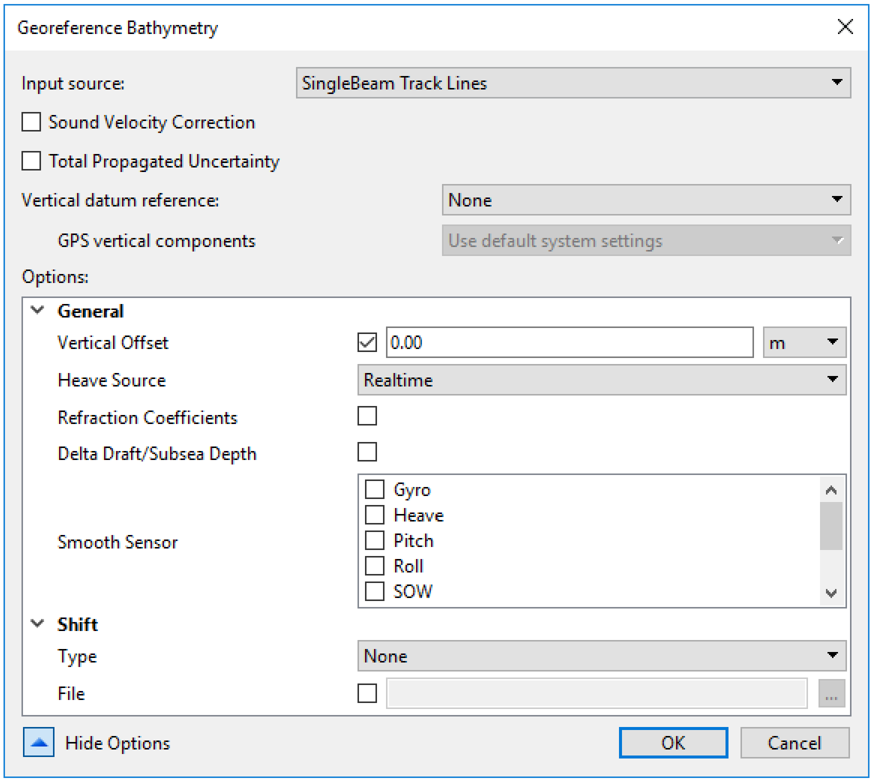
Horizontal Component:



Consider a transducer whose horizontal X, Y position = Reference Position (RP) = Origin.

- The horizontal position for each sounding (X, Y) in each swath is relative to the Reference Position at the time of the ping.
- The gyro observation is interpolated to obtain a gyro reading at the exact time of the ping. The X,Y coordinates for each sounding in the swath are rotated by the interpolated gyro observation.
- The coordinates are then converted to delta Longitude and delta Latitude.
- The geographic coordinates of the RP (Longitude and Latitude) are computed from the geographic coordinates of the GPS antenna (Navigation Data), using the antenna offset information in the HVF, and then interpolated for the exact time of the ping.
- The final geographic coordinate for each sounding in the profile is computed by applying the delta Longitude and delta Latitude to the RP's Longitude and Latitude.

This process is repeated for every swath in each line.



Exercise 14.

a. Click on the **Georeference Bathymetry** icon or select **Tools > HIPS and SIPS > Georeference Bathymetry** from the menu.

b. On **Input Source** select **Singlebeam Track lines**.

c. Click on the blue down arrow **Show Options**.

The **Vertical Offset**, allows to introduce a fixed single value offset, to be applied to all soundings.

The **Heave Source** was designed to apply **Realtime** (Original Heave) or **Delayed Heave** (Post-Processed) and all other motion data during Georeference for data source not already compensated for by the Sound Velocity process.

Refraction coefficients option, will apply them if they were saved on the lines in Refraction Editor.

If smoothing coefficients are created in **Attitude editor** for the data types listed, you can select to use the **Smooth Sensor** data for the re-computation of the observed depths. You will determine if smoothing coefficients are required during the data quality control portion of this training module.

Also a **Shift** option (a per beam shift to the processed depth solution from a beam look-up table), can be applied on this step.

d. On **Heave Source**, leave **Realtime**.

e. Leave all other parameters by default.

Georeference Bathymetry takes into consideration all of the horizontal and vertical offsets in the HVF to produce a processed sounding. Parameters marked with an asterisk ("*") will be applied in the SVC process:

- Observed depth
- Navigation
- Gyro
- Tide or GPS tide
- Calibration parameters
- Delta draft
- Refraction coefficients
- Motion data (Heave or Delayed Heave, Pitch, and Roll)*
- Waterline*
- Dynamic draft

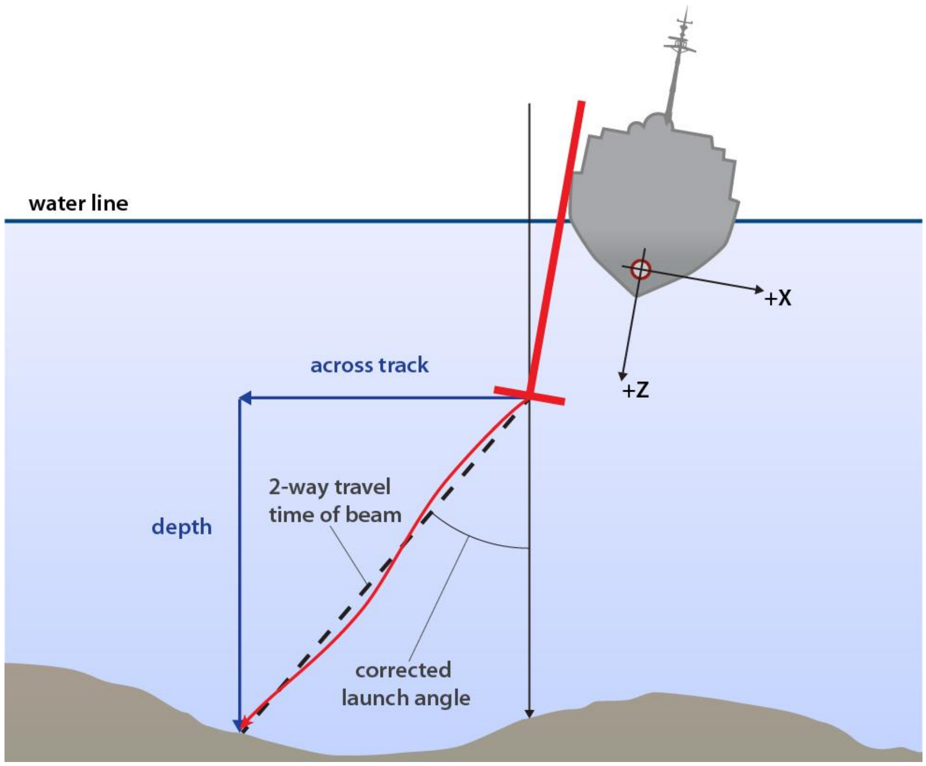
Sound Velocity Correction

Raw data formats such as **HXS** contain two-way travel time and beam launch angles. Producing a geographically referenced sounding position and depth from this data is a two-stage process.

1. The procedure for calculating the length and path of the sound wave through the water column for each beam is called the Sound Velocity Correction (SVC). The result is an along-track/across-track/depth for each beam.

2. The Georeference Bathymetry process (which is explained later in this training course) converts the along-track/across-track/depths into latitude, longitude, depth by combining the ship navigation with horizontal and vertical offsets in the HIPS vessel file.

The **SVC** algorithm calculates the ray path of the sound wave through the water column for each beam. In order to do this the program needs to know several things:



- Any rotations that have to be applied to the sensor head – both static (i.e., setup and calibration parameters) and dynamic (measured by the attitude sensors).

- The acoustic velocity of the water column. This information is loaded into the program as a sound velocity profile.

f. Check the option **Sound Velocity Correction**. SVC Options will appear on the options window.

There are different options for applying velocity information to a swath:

- **Previous in time** – This is the method traditionally used by HIPS, which applies the profile taken immediately before the collected swath.

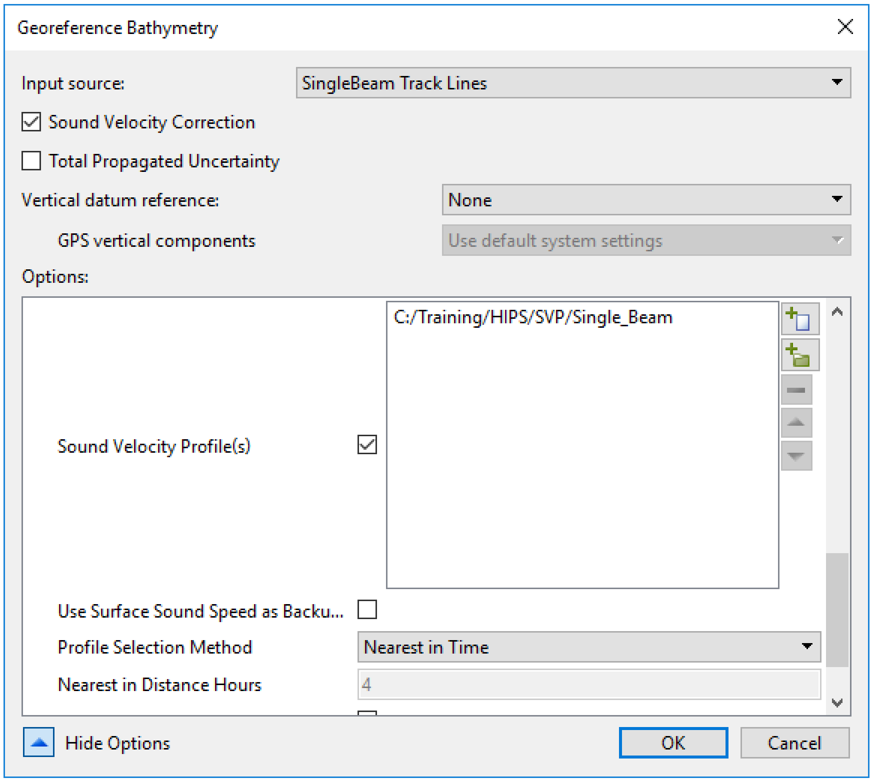
- **Nearest in time** – In this situation HIPS will apply the SVP with the time stamp closest to that of the collected swath.

- **Nearest in distance** – Uses the position attributes of the profile to determine the nearest profile to a given swath.

- **Nearest in distance within time** – Uses the position attributes of the profile to determine the nearest profile to a given swath within a time window which the operator has to enter.

Note: The profile selection methods listed above are made on a swath-by-swath basis and so it is possible to have several SVPs used in the same survey line.

Sound Velocity Correction supports some motion-compensated multibeam systems. In these cases, the process checks the HVF to see if the heave, pitch, and roll are set to Apply "Yes".



g. Enable the check box beside **Sound Velocity Profile(s)**.

h. Click the **browse to select a folder** button and browse to the **…\SVP\Single_Beam** folder, click Select Folder.

Note: as of HIPS 11.0, users can point to a folder, which contains all of their SVP file. The process will utilize all SVP file within the folder on the track lines going by the Input sources selection, either All Track Lines or Selected Track Lines. Additionally, SVP files at different rootpath locations can be selected and all used during the same process. This has eliminated the need for users to combine all of their casts for a survey within a single SVP file.

i. Select the **Nearest in Time** option from the Profile Selection Method drop down menu.

Since release of HIPS 11.2.6, a new option, **Use Surface Sound Speed as backup SVP**, has been added to the Sound Velocity Correction options in Georeference Bathymetry. This option will allow a user to pick up the SSP data in a line to use as a sound velocity profile (SVP) through the water column when the data does not contain any imported or loaded SVP information.

Note: As of HIPS 8.1, the functionality for using available SSP data has changed. SSP information is automatically imported. However, users now have a choice whether to use this information during SVC. If the "Use Surface Sound Speed if available" check box is NOT checked, SSP will NOT be added to the profile for SVC. Additionally, users can choose to recompute the beam steering based on interpolated surface sound speed from the available sound velocity profiles (not recommended if the SSP sensor information is available and valid).

If smoothing coefficients are created in Attitude editor for the data types used during SVC, you can select to use the smoothed data for the re-computation of the observed depths. We will determine if smoothing coefficients are required during the data quality control portion of this training module.

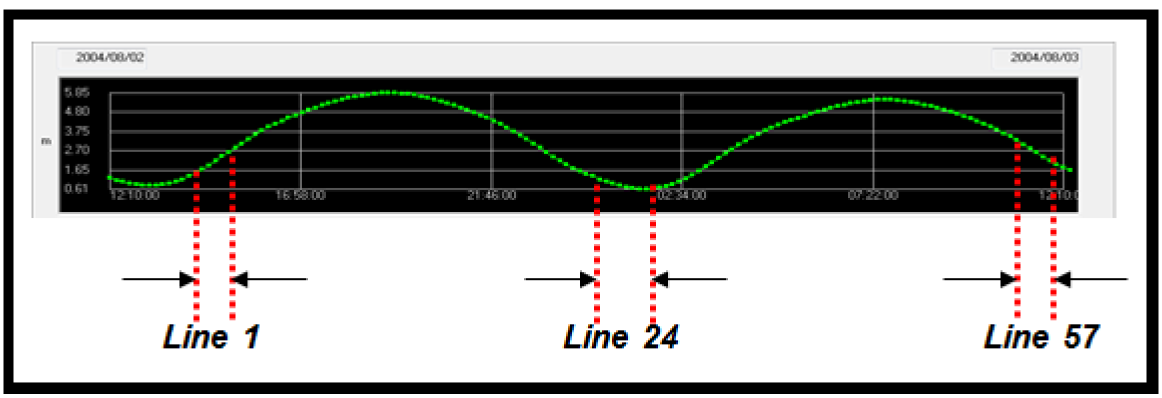
Vertical Datum Reference

You can choose from three different Tide Options from the Tide drop list in Georeference Bathymetry:

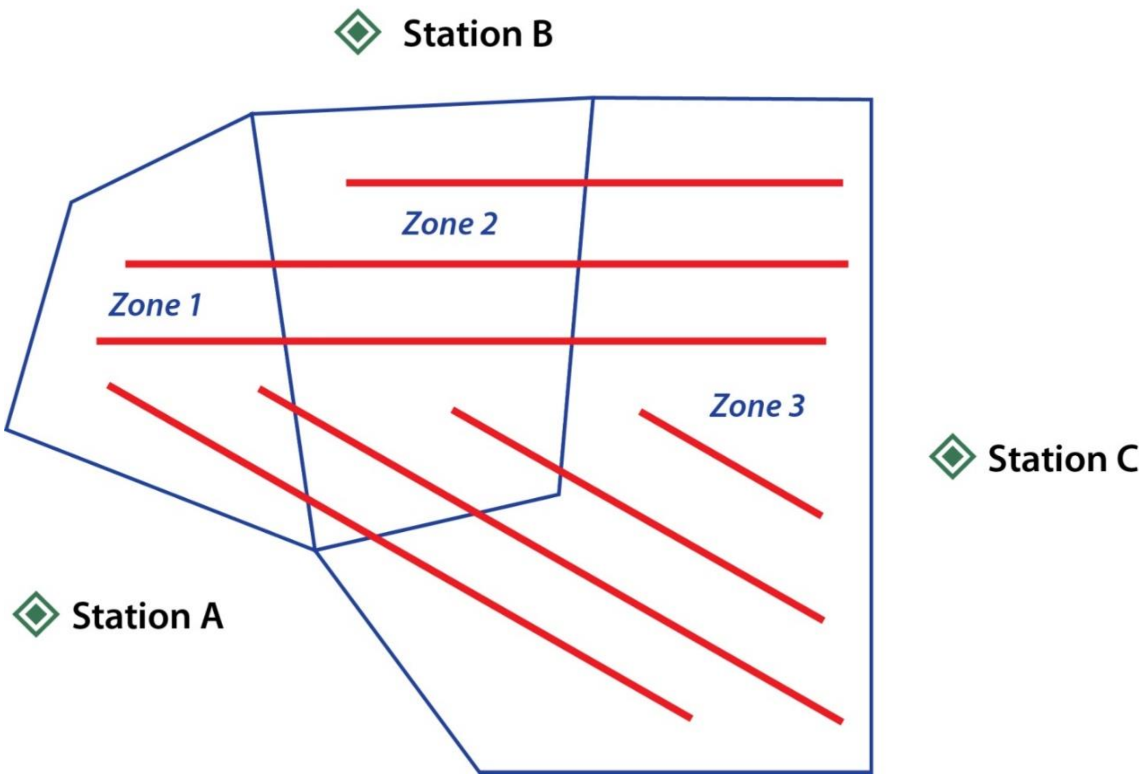
None: With this option, no tidal correction will be applied (Zero Tide). This is the default setting.
Tide: Options for Observed tidal corrections will be displayed.
GPS: Options for GPS tidal corrections will be displayed.

Observed tidal corrections involves applying data collected from tide stations and optionally using zones, which cover the survey area.

- The tide data from a single tide station can be applied to each survey line as a whole.



- Tide data from multiple tide stations can be compiled. The tide data is loaded for each part of a line as determined by the zone the part falls into.



To define a tide zone several parameters are required:

- Zone boundary in geographic coordinates
- The location of the primary tide station
- Locations of up to 3 optional secondary tide stations
- Time offset in minutes for each station
- Range offset / tide scalar for each station (e.g., 1.01)
- Outage limit in minutes controls when data will be extracted from secondary stations
- Interpolation interval in seconds for final interpolated tide loaded into each survey line data structure.

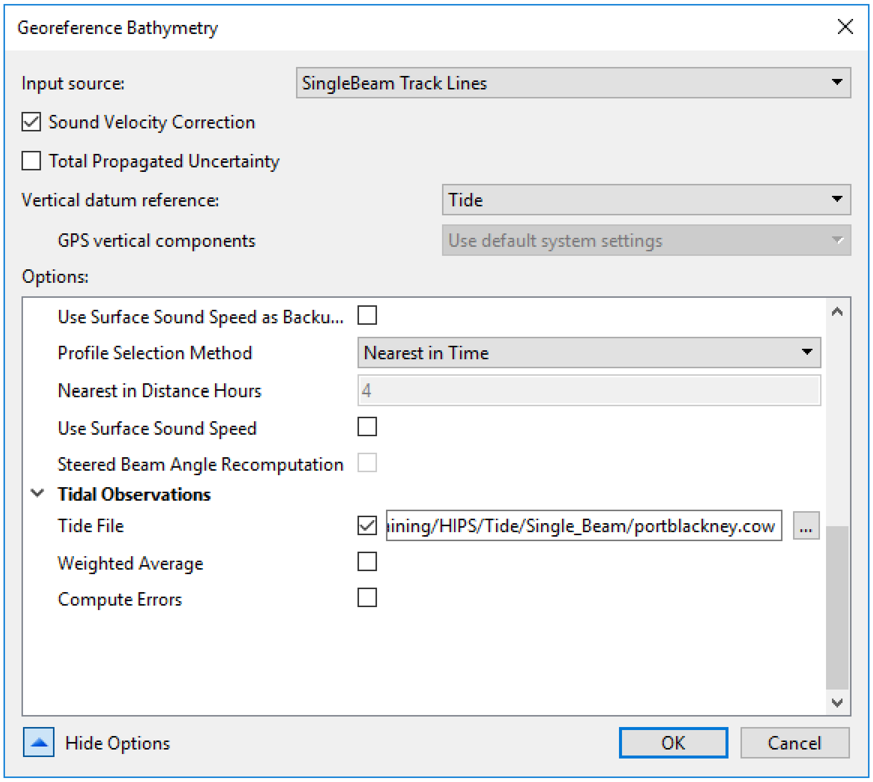
Note: Loaded tide data can be viewed and filtered using the Attitude Editor.

When using data from multiple stations, a weighted average of tidal observations along the survey line can be generated. This only works if information about the tide stations is given in the tide zone file. The weight given to the tide data is inversely proportional to the distance between the station and the swath data, which is why the zone definition file should include latitude and longitude positions for tide stations.

For this exercise, you will load tidal data from a single tide station.

Exercise 15.

a. Within the Active Track Line window select Track Lines, then select the **Georeference Bathymetry** icon, or select **Process > Georeference Bathymetry.**



b. On **Vertical datum reference**, select **Tide** from the drop list. **Tidal Observations** Options will appear on the options window.

c. Enable the **Tide File** checkbox and click the **browse** button, open the **portblackney.cow** file from the **…\Tide\Single_Beam** folder.

d. Do not enable the check boxes for the Weighted Average or Compute Errors.

e. Click **OK**.

The tide observations will be loaded to the survey lines based on time stamps. The vertical datum will be applied during the Georefrence process so that our observed depths can be reduced to the working chart datum.

Surface Creation

A gridded surface can only be created after the soundings are georeferenced (Georeference Bathymetry Process). The CARIS surface is a gridded representation of the georeferenced sounding data, created using various gridding algorithms.

We will go over the theory for the two ideal surface types to be used while working with Single Beam bathymetry data.

Storage Technology

The CARIS storage framework, called CSAR (for **C**ARIS **S**patial **AR**chive), in HIPS and SIPS is a portable file format for the storage of terabytes of data, along with associated metadata.

This framework gives users the advantages of:

- Enhanced storage and management of large volumes of multi-dimensional data.
- Efficient retrieval of data from files and/or database storage devices, including:
  - Retrieving and loading data
  - Caching data in memory
  - Writing modifications back to storage device

Regular Gridded Surfaces

HIPS supports the ability to create four different types of Regular Gridded surface:

- Swath Angle
- Shoalest Depth True Position
- Uncertainty
- CUBE (Combined Uncertainty and Bathymetry Estimator)

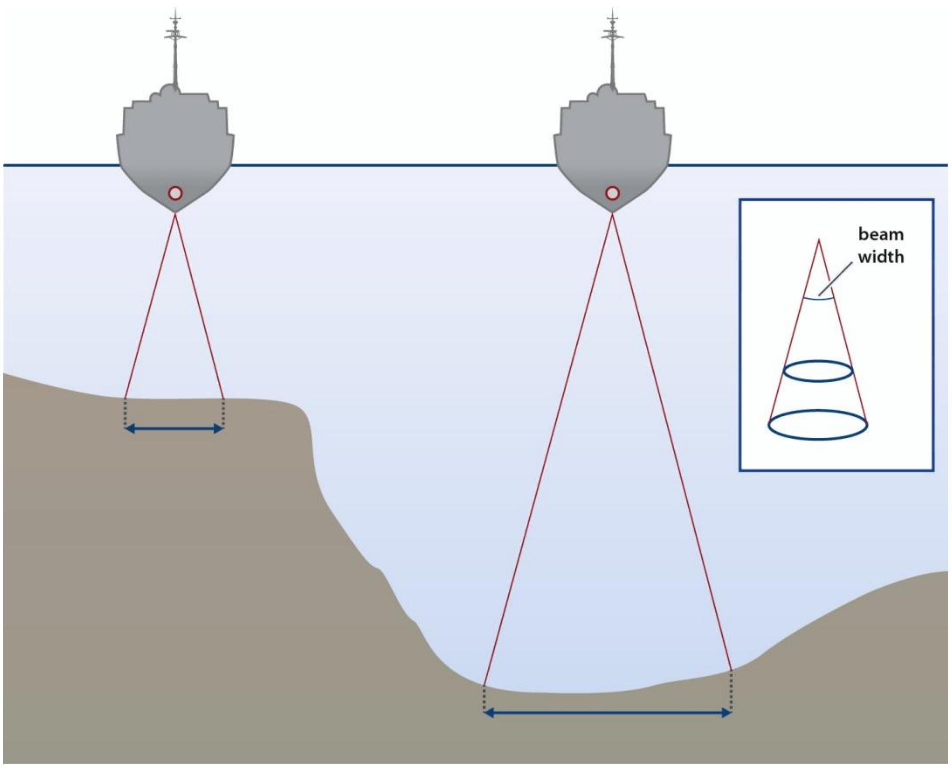
Through the Surface wizard users can select which type will be created. The surface types use different weighting algorithms to produce grids of the sonar data. All four surface types will produce a smooth surface that retains the sonar resolution. Users also have the ability to preserve shoal or critical values.

Since there are no Uncertainties (TPU) calculated for the soundings, we are limited in this exercise, to algorithms Swath Angle and Shoalest Depth True Position.

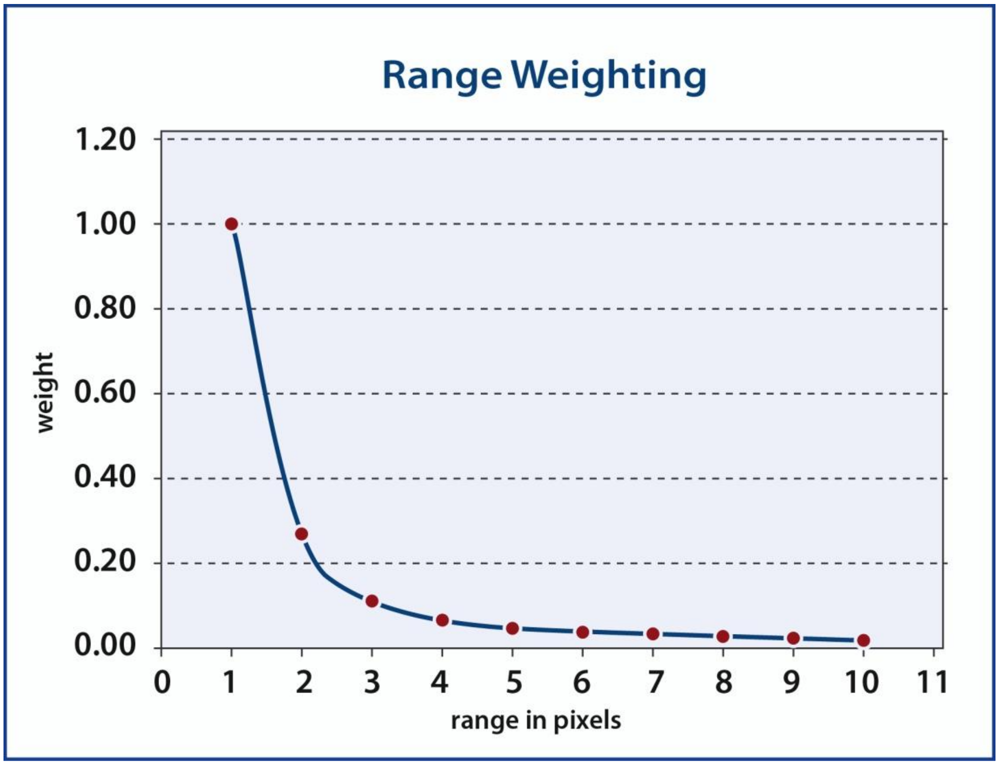
Swath Angle Surface

The Swath Angle surface is a rasterization method specifically designed for multibeam data. It is an accurate representation of multibeam data because it considers the actual geometry of the sonar system. It does this in three ways:

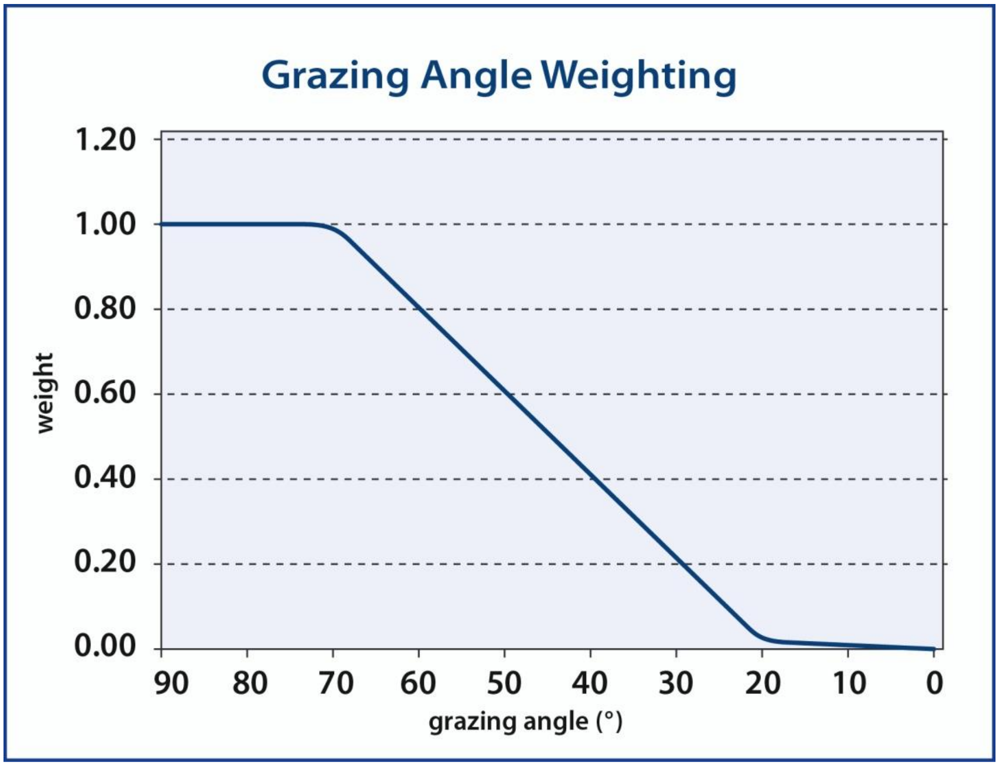
- **Variable radius of influence weighting**- The weighting is inversely proportional of radius of influence of each sounding, which is calculated from the beam width of the selected sonar, and increases with depth and decreases with the grazing angle. This addresses the increase in footprint size with distance from the sonar head.



- **Range weighting** - The range weighting for each sounding decreases with distance from a node. This lessens the effect that soundings further away from the node will have on the surface. The number of nodes each sounding is applied to is determined by the size of the beam footprint. The beam footprint is calculated using depth, sonar beam width, and the grazing angle.



- **Grazing angle weighting -** Errors in multibeam data tend to increase in magnitude in the outer beams due to the longer ray path distances. This tends to magnify refraction problems and other errors. The grazing angle weight function is applied to each sounding to reduce the effects of the outer beam soundings on the surface.



This weight function is controlled in an ASCII file called **grazingangleweights.txt** in the System directory. This file can be modified by users.

The swath angle surface can provide the following layers:

Required:

- **Depth:** The weighted depth based on the above considerations

Optional:

- **Density:** Creates an attribute layer that displays the number of soundings used at the grid node
- **Mean:** Creates an attribute layer that displays the arithmetic mean of all depths used to determine the weighted depth
- **Standard Deviation:** Creates an attribute layer that displays the standard deviation of all the depth data used at the node from the mean.
- **Shoal:** Creates an attribute layer that displays the shoalest sounding contributing to a node, represented at the grid node location

- **Deep**: Creates an attribute layer that displays the deepest sounding contributing to a node, represented at the grid node location

Shoalest Depth True Position

The Shoalest Depth True Position surface most closely resembles a binning technique, where the bin size is defined as the resolution. This surface stores the shoalest depth within a given node in the depth layer

The Shoalest Depth True Position surface can provide the following layers:

Required:

- **Depth:** The shoalest depth value within the bin with its original position.

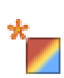
Optional:

- **Density:** Creates an attribute layer that displays the number of soundings used at the grid node
- **Mean:** Creates an attribute layer that displays the arithmetic mean of all depths used to determine the weighted depth
- **Standard Deviation:** Creates an attribute layer that displays the standard deviation of all the depth data used at the node from the mean.
- **Deep**: Creates an attribute layer that displays the deepest sounding contributing to a node, represented at the grid node location
- **Median:** Creates an attribute layer that displays the median values of soundings contributing to the node.
- **Horizontal TPU:** Creates an attribute layer that displays Horizontal TPU value of the shoalest sounding
- **Vertical TPU:** Creates an attribute layer that displays Vertical TPU value of the shoalest sounding.

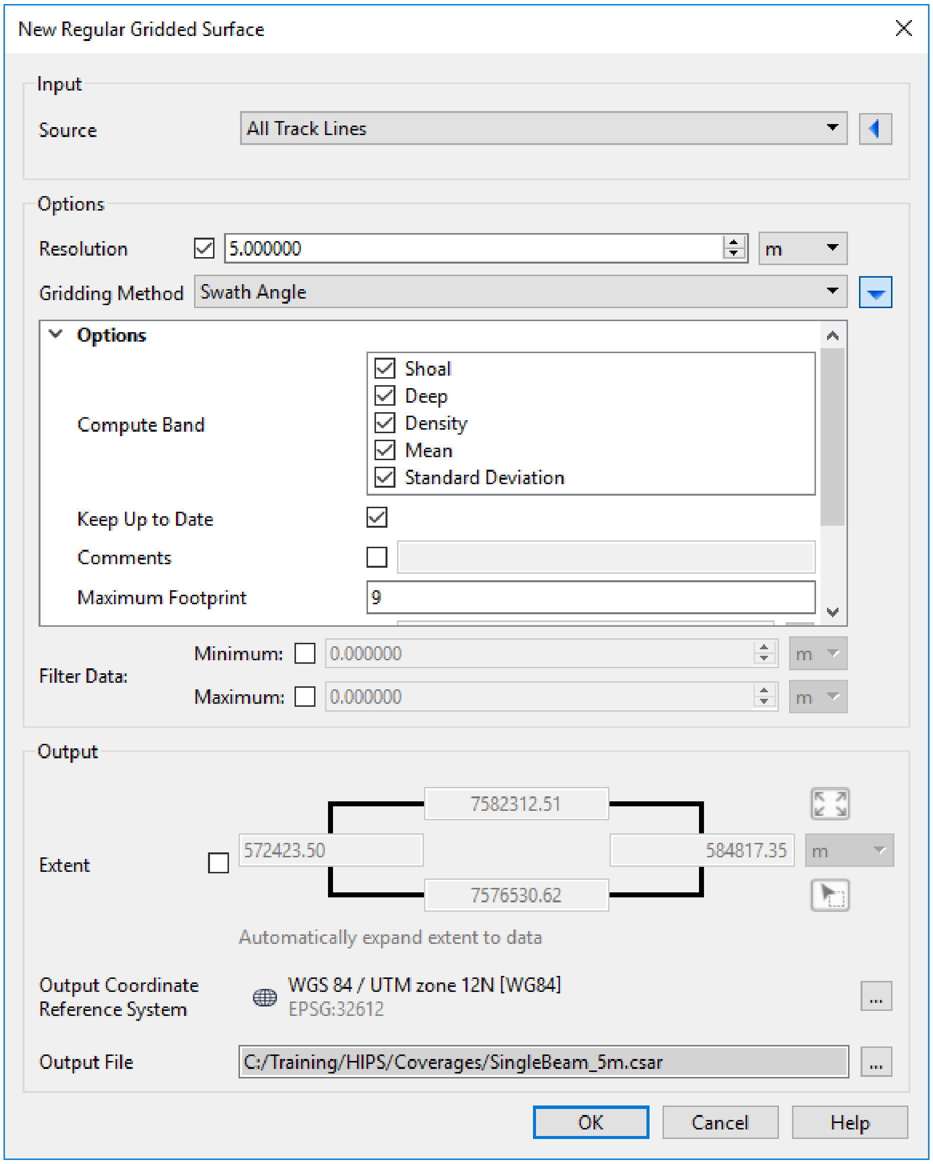
If Horizontal and Vertical Uncertainty do not exist for the lines selected, the surface creation will continue without these attributes. If, at a later time, uncertainty data becomes available, a surface recomputation can be applied and the surface will be updated accordingly.

Since HIPS 9.0 the current display extents are used to generate the surface. It is possible to pan and zoom when defining the surface extents.

Exercise 16.



a. Select the **New Regular Gridded Surface** icon or the **Tools> Coverages > Grid > Single Resolution Surface…** option from the main menu.



b. Enable the **Resolution** checkbox and enter a resolution of **5** m

c. Select **Swath Angle** for the **Gridding Method**.

The current display extents can be used (by default) to generate the surface extents. It is possible to pan and zoom when defining the surface extents with the **Use Screen Extents** icon.

In addition, you can draw a different sub-area with the **Pick from Screen icon**, or simply introducing new coordinates on the **Extent** Boxes (West, South, North and East).

Since the release of HIPS 11.2, you can use the option **Automatic expand extent to data**, this eliminates the need to define the extents of a coverage using the Create HIPS Grid and Create SIPS Mosaic processes, either through the application interface, process models or CARIS Batch.

Having the extents of the CSAR automatically update is particularly useful when surveying an area with uncertain final extents; as new areas are surveyed, the extents of the CSAR will automatically update to include the new data and not require a new coverage each time data is imported. This also means the Overview command will use the current extents of the data and not the predefined extents in the coverage; reducing the need to zoom in after applying Overview to coverages that anticipate more data to be added.

No functional changes are expected for the existing CSAR support when the extents are set to fixed. When expanding extents are used, previous versions of the software will not be able to open the data. The **File > Save As..**. functionality can be used to create a new CSAR that is compatible with previous versions.

d. On **Output > Extent**, uncheck the check box. **Automatic expand extent to data** should be showed.

e. All additional parameters can stay set to the default settings.

f. Click the browse button (**…**) on **Output File** and name the coverage **SingleBeam_5m**, in to **…\HIPS\Coverages** folder and click **Save**. Click **OK** to create the surface.

Bathymetric Products

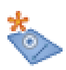
Bathymetric products could be generated from the Swath Angle surface created in the previous exercise, or other layers that can be created from the data to be used for further analysis. In the next few exercises, we will examine some of the post processing options for creating some of these products.

Sounding Selection

It is impossible to display all soundings produced by a multibeam survey on a map or chart and maintain legibility. The selection of soundings that appear should be dependent on chart scale and purpose. A chart in scale 1:10,000 would contain more soundings than the same size in scale 1:50,000. Soundings can be created from a tile layer or surface.

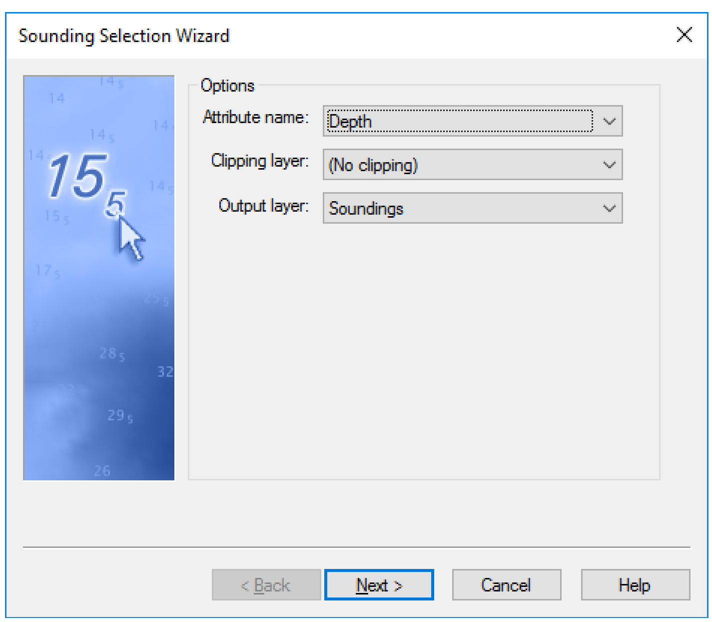
In the following exercise we will first import the soundings created during the Critical Soundings Selection Tool to a new feature layer. The Soundings Selection tool will fill in the gaps around the imported soundings.

Exercise 17.



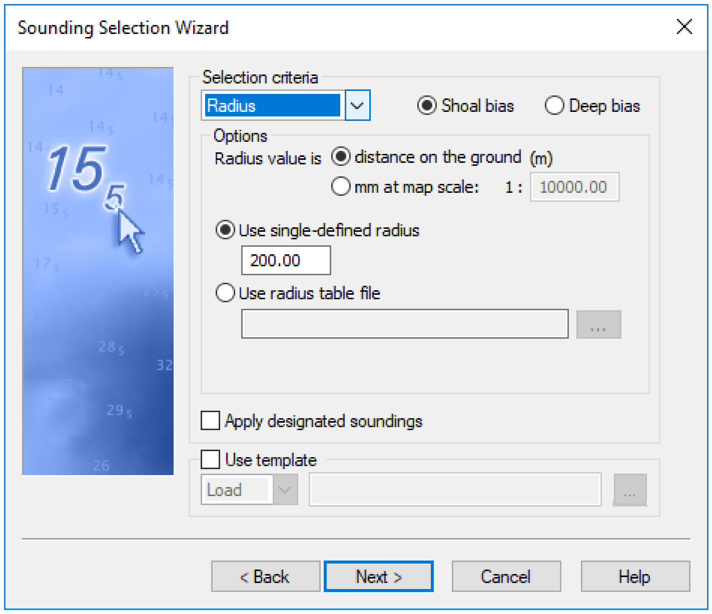
a. Click the **New Feature Layer** icon or the **File > New > Feature Layer…** option form the main menu.

b. Give the name of **Soundings**, Catalogue: **Bathy DataBASE,** Type: **S-57 / S-100.** Click **OK.**

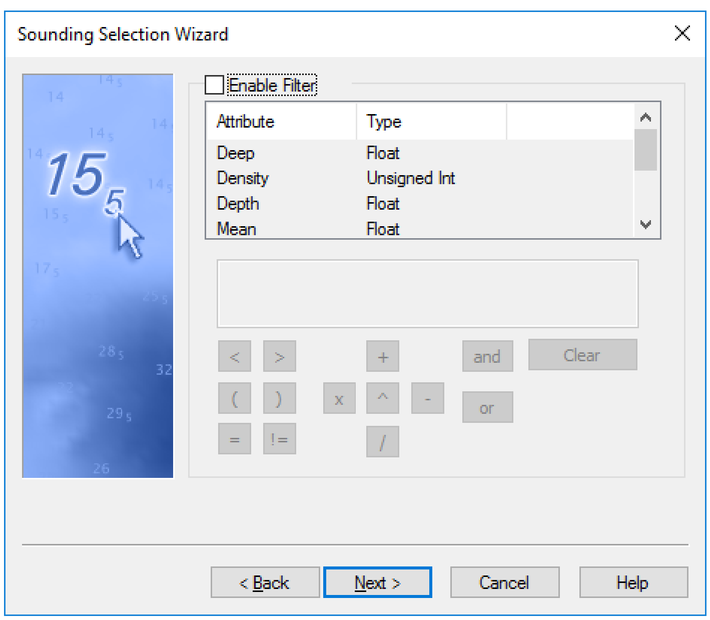


c. Highlight the **SingleBeam_5m** surface from the **Layers** window. Click the **Sounding Selection** icon or the **Tools > Features > Sounding Selection…** option from the main menu.

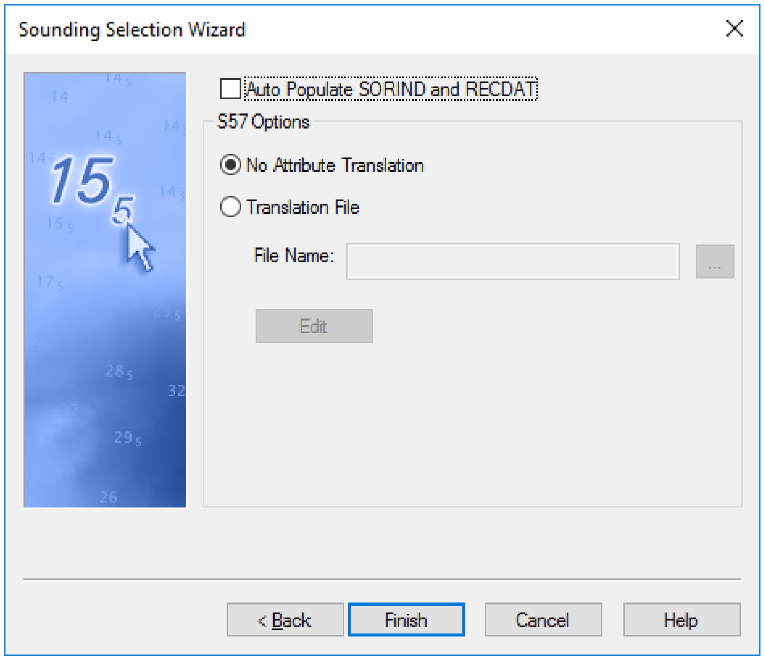
d. Select Attribute name as **Depth** and Output layer as **Soundings,** click **Next.**



e. Select the **Radius** Selection criteria and choose **Shoal bias**. Radius value is **distance on the ground (m)**. Enter a **Use Single Defined Radius** value of **200**, and click **Next.**

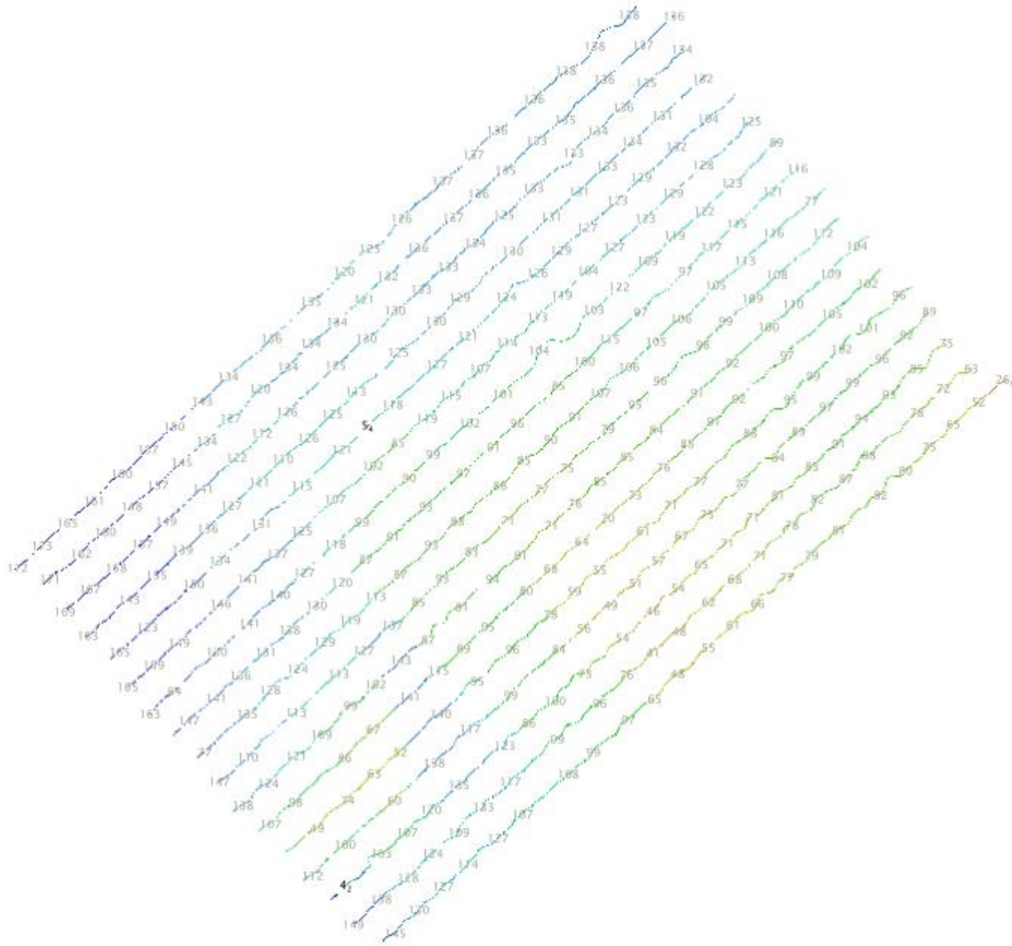


f. Do not enable any filters, click **Next.**



g. Do not check **Auto Populate SORIND and RECDAT** and check **No Attribute Translation**. Click **Finish**

Note: In most situations, it is wise to use the same data source for soundings and for contours. This removes the possibility of producing soundings on the wrong side of contours



Export Data

Data can be exported from HIPS and SIPS to a variety of formats. It is possible to export vector products (i.e. contours and soundings), HIPS data, surfaces, the Display View, Contacts, and Mosaics.

Export Bathymetry

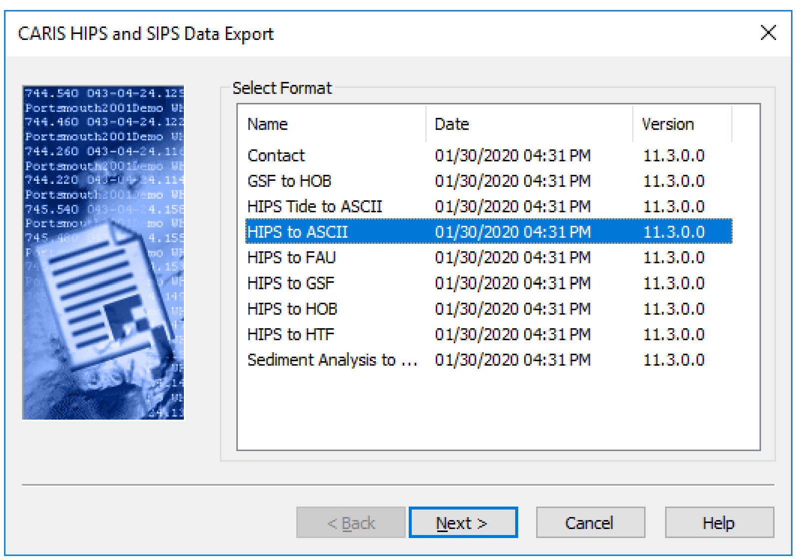
HIPS data (soundings) can be exported to ASCII and other formats. Additionally, bathymetry from surfaces can be exported to images, other gridded data formats (such as point cloud or BAG), and to ASCII.

HIPS to ASCII

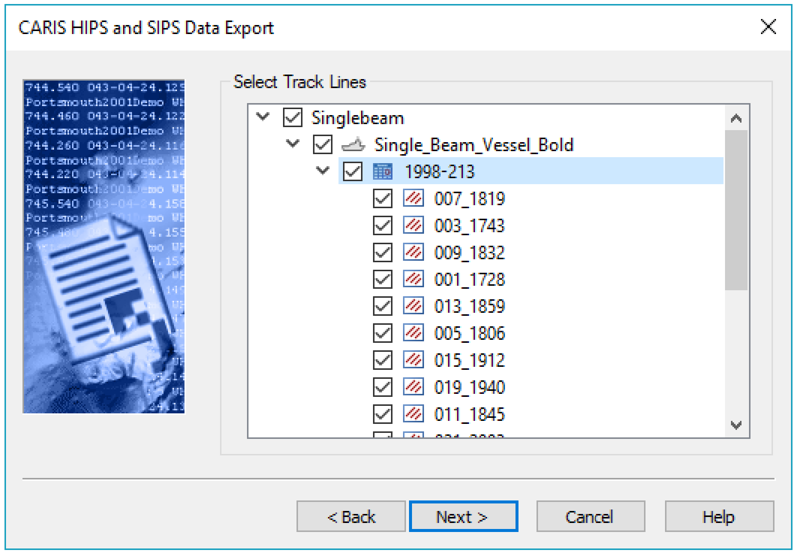
Exercise 18.

a. Select **File > Export > Coverages > HIPS and SIPS Data…** from the main menu or Click the **Data Export Wizard** icon from the main toolbar.

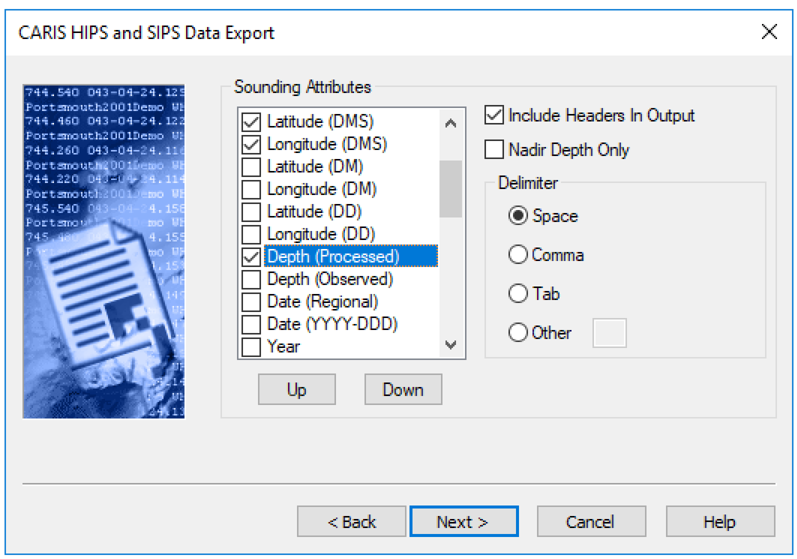
This will launch the **CARIS HIPS and SIPS Data Export** wizard. There are various export options available. This example covers the **HIPS to ASCII** export. The generic ASCII text file can then be used for data transfer**.**



b. Select **HIPS to ASCII** and click **Next**.



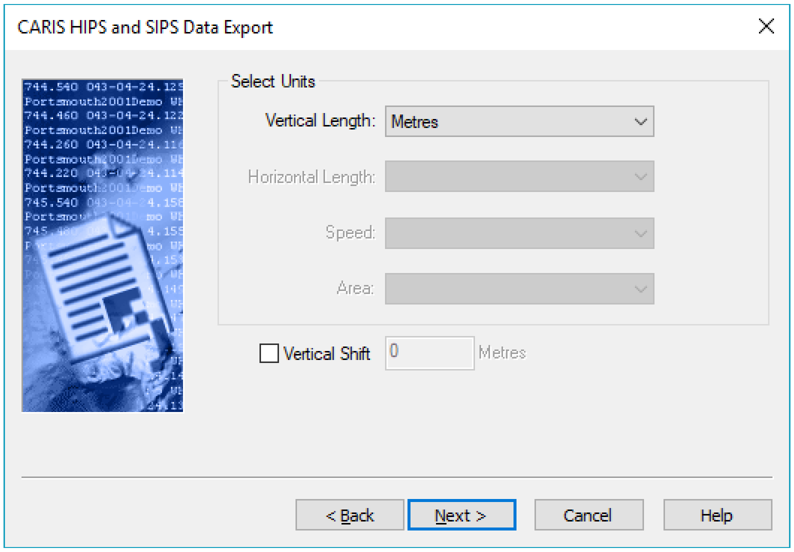
c. Select **1998-213** to enable all lines within the survey day to be exported and click **Next**.



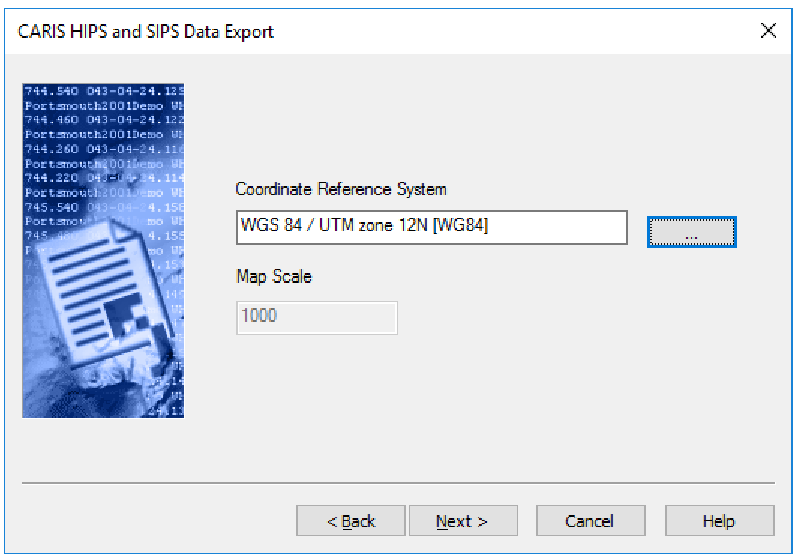
d. Select the following **Sounding Attributes** to be exported to ASCII file: **Latitude (DMS)**, **Longitude (DMS)**, **Depth (Processed)**, and **Status**.

e. Select **Include Headers in Output** to display column headings in the text file and click **Space** as the **Delimiter.** Click **Next**.

You can change the order that the attributes will be written to the ASCII file by highlighting the attribute in the table and clicking the Up or Down buttons.

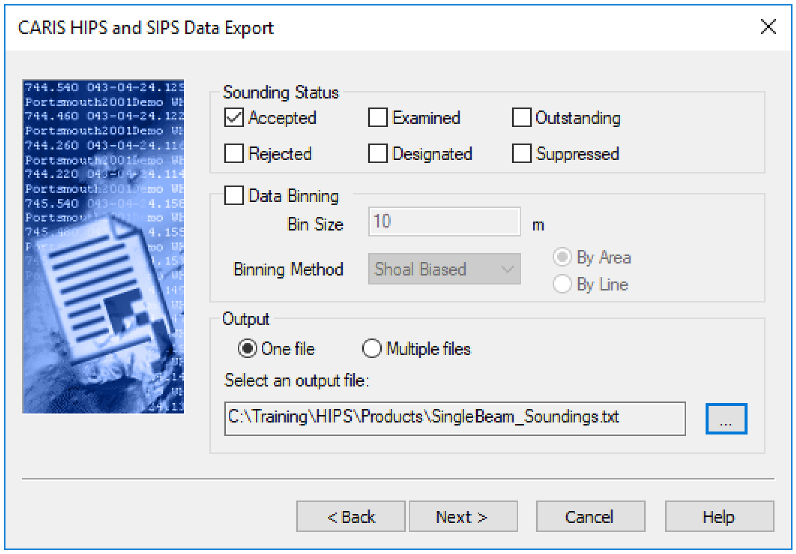


f. Set the **Vertical Length** units to **Metres** and click **Next**.



g. In **Coordinate Reference System,** click Browse **…** and select **WG84 / UTM zone 12N [WG84]** from the **Favourites** tab, click **OK** and click **Next**.

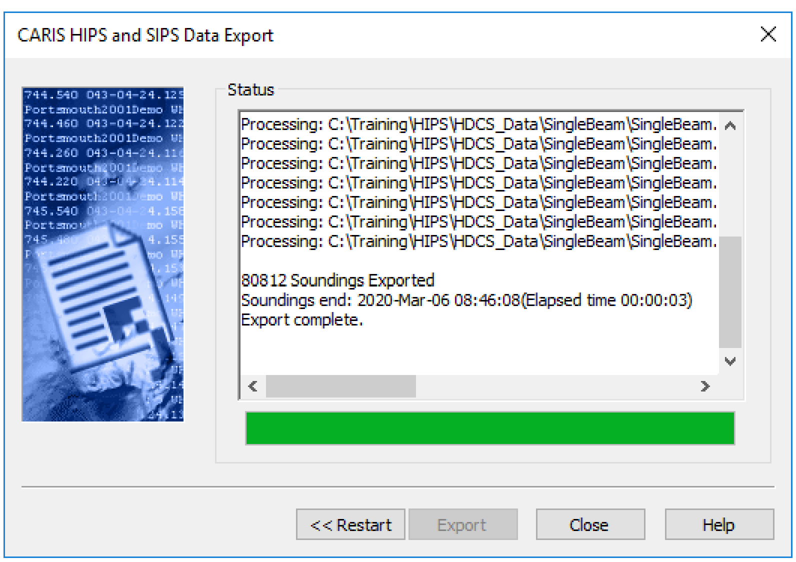
Previously you have selected to export the coordinate information as Latitude and Longitude. Therefore, the selected projection will not influence the exported data**.**



h. Select to include Sounding Status **Accepted**. Disable the **Data Binning** checkbox.

i. Specify the Output as **One File**, name it **SingleBeam_Soundings.txt** on to the **…\Products** folder, click **Next**.

By enabling the Data Binning option, a shoal-biased data binning, or thinning, will occur. The shoalest sounding within each specified bin will be selected as the representative soundings and exported to the ASCII file. If Data binning is not enabled all of the processed soundings for the selected lines will be exported to the ASCII file.



j. Step 7: Click **Export** to start the process, and then **close** the Export wizard when the export is complete.

You can check the results on any Text Editor opening the exported .txt files.

Export Surface

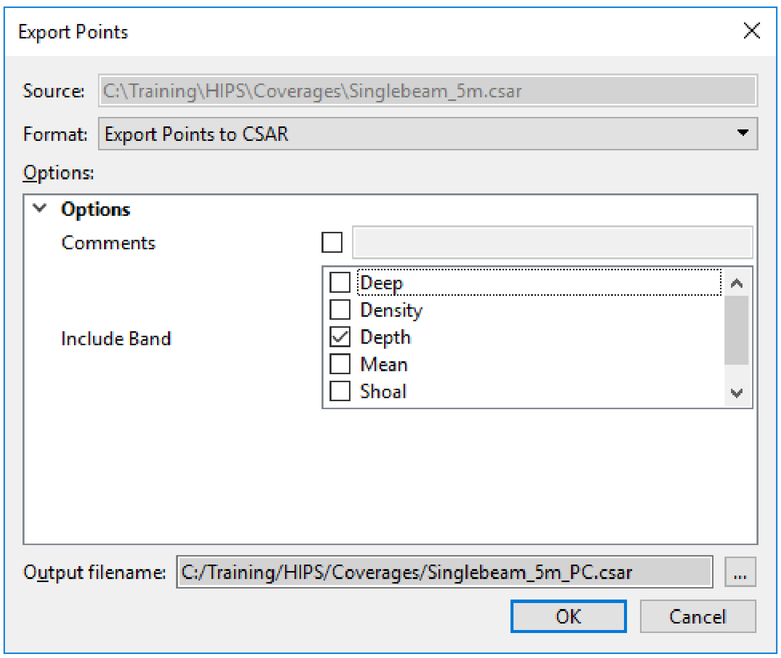
The surface generated in HIPS and SIPS can be exported to ASCII or several Raster formats, like point cloud (Csar), GeoTIFF and BAG. The export to raster formats (except point cloud), makes use of the new Raster Product Export tool. Using the Raster Product Export tool, you can export your surface to different raster formats in one go. It also allows you to save your settings in a template file so that the same settings can be used multiple times in the future.

Surface to Point Cloud

Exercise 19.

a. Highlight the **SingleBeam_5m** layer within the **Layers** window.

b. Choose **File > Export > Coverages > Points…**



c. On **Format,** choose **Export Points to CSAR**.

d. Enable **Depth** on **Include Band**.

e. On **Output filename** browse to **…\Coverages** folder and name it **Singlebeam_5m_PC.csar**

Appendix A: Additional Utilities

CARIS HIPS and SIPS includes several additional utilities to assist you in various tasks outside of the normal workflow:

- CARIS Batch
- Configuration Reporter
- Command Line GUI
- Dump utilities
- Print utilities

CARIS Batch

With the release of HIPS and SIPS 10.0 CARIS Batch tools are available. The CARIS Batch utility runs command-line processes on marine products generated from CARIS applications. CARIS Batch is installed in the \Bin folder of a CARIS application.

To run carisbatch go to **View** > **Toolbars** and click **Interactive** to open;

With the drop-down of **Show command prompt** selected click the Run icon to open Command Prompt.

The basic syntax for carisbatch is:

```
carisbatch --run <process_name> <parameters> <input> <output>
```

The -r key or --run parameter is required to run a process. Processes are bound by the following rules:

- Parameters are identified either by character keys or parameter names. Keys use a single-hyphen prefix (-h) and parameter names use a double-hyphen prefix (--help).
- Values are separated from parameters by a space (e.g. -n 6).
- Parameter values with spaces must be enclosed in quotation marks (e.g. -c "New DSID Comment").
- Process names are not case-sensitive, but parameter names are. Be careful when entering parameters.

Processes available to run in CARIS Batch (HIPS) are (type **carisbatch -l** and click enter):

Grouped Processes:

- AddToSIPSMosaic
- ContourRaster
- CreateHIPSGrid
- CreateSIPSBeamPattern
- CreateSIPSMosaic
- CreateVRSurface
- DifferenceCoverages
- ExportCoverageMetadata
- ExportHIPS
- ExportPoints
- ExportRaster
- ImportHIPSFromAuxiliary
- ImportToHIPS
- ImportVRSurface
- PopulateVRSurface
- ShiftElevationBands
- SoundVelocityCorrectHIPS
- SplitCoverage

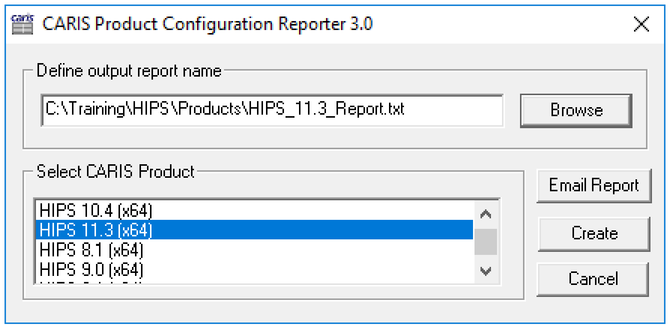
- AddComputedBand
- AddFeatures
- AddKrakenTILToMosaic
- AddSmoothedBand
- AddToHIPSGrid
- AddToVRSurface
- ChangeFeatureAttributes
- ClassifyHIPSNoise
- ClassifyRasterHolidays
- ClipFeatures
- ClipRaster
- ComputeHIPSBoresightCalibration
- ComputeHIPSSeparationModel
- ComputeSIPSTowfishNavigation
- CopyHIPSToHIPS
- CopyToCSAR
- CreateFeatureRelationships
- CreateHIPSFile
- CreateHIPSVesselFile
- CreateSoundingsFromCoverage
- DeleteFeatures
- DetectHIPSCriticalSoundings
- DissolveFeatures
- EraseFeatures
- ExportCoverageToASCII
- ExportFeaturesToShapefile
- ExportToWKT
- ExportVRSurfaceToBAG
- ExtractCoverage
- FillRasterHolidays
- FilterCoverage
- FilterFeatures
- FilterHIPSAttitude
- FilterObservedDepths
- FilterProcessedDepths
- FinalizeRaster
- FinalizeVRSurface
- GeneralizeRaster
- GeoreferenceHIPSBathymetry
- ImportGenericToHIPS
- ImportKrakenTILToMosaic
- ImportMultipleDetectionsToHIPS
- MoveHIPSToHIPS
- RecomputeHIPSGrid
- RemoveFromHIPSGrid
- RemoveFromSIPSMosaic
- RemoveFromVRSurface
- RenderRaster
- RepairCoverage
- ResampleSurfaceToRaster
- ResetHIPSStatus
- ScaleHIPSAttitude
- SetHIPSNavigationSource
- ShiftHIPSNavigation
- SimplifyFeatures
- SmoothFeatures
- TileRaster
- UpdateFeatures
- UpdateHIPSAdditionalBathymetry
- UpdateRasterCUBEDisambiguation
- UpdateSIPSContactPositions
- UpdateVRCUBEDisambiguation
- UpgradeHIPSandSIPSDataStructure
- ValidateCoverage
- VectorizeRaster

To consult the specific parameter for each process in CARIS Batch, please refer to CARIS Batch Utility Reference Guide, included on HIPS Documentation.

Configuration Report

A useful tool to help diagnose problems in the HIPS and SIPS system setup is the configuration report. If problems occur and you need support, run this tool, create the report and email it with description of the issue to CARIS Customer Support.

This utility can be run on any CARIS product installed on the computer.



The items included in the report are as follows:

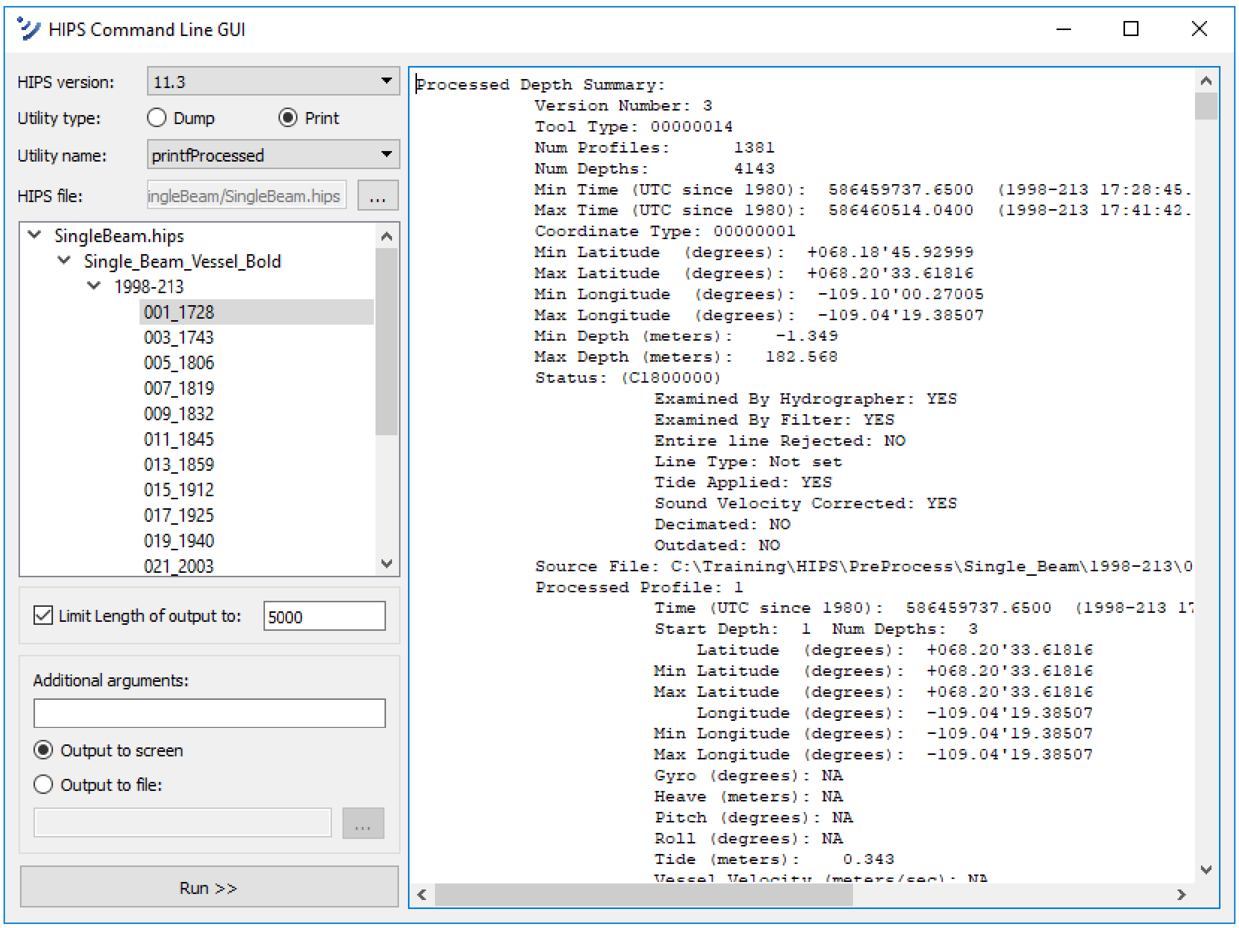
- Program, Version, and Link Date
- Environment
- System Information
- System and User's Environment
- CARIS Licensing Report

Command Line Utilities

You have the option to write out raw data formats to ASCII or HIPS data formats to ASCII using command line utilities installed with HIPS and SIPS. These command line utilities can be run from a cmd window or by using the Command Line Utilities GUI.

Command Line Utilities GUI

Visit the CARIS Online Customer Services website to download the Command Line Utility GUI, which can run all printf and dump commands within a user-friendly interface.



Exercise 20.

a. Open the Command Line GUI.

b. Select Utility type **Print** and Utility name **printfProcessed**.

c. Select the HIPS file **C:\Training\HIPS\HDCS_Data\Singlebeam\Singlebeam.hips**

d. Expand the Data source and select the line **001_1728**.

e. **Output to Screen** is selected by default, click on **Run** to view the processed data within the selected line folder.

Similarly, raw data formats can be "dumped" to an ASCII file or to the screen. There is no exercise showing this here because the raw data used in this training is Hypack *.hsx format, which is already ASCII.